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Self-Focused Attention and Appearance-Related Comparisons in Body Dysmorphic Disorder

Turner, Mark

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Volume I

MAIN RESEARCH PROJECT AND SERVICE EVALUATION PROJECT

Mark A. Turner

Thesis submitted in partial fulfilment of the degree
of Doctorate in Clinical Psychology

Institute of Psychiatry, King's College London

May 2012

Preface

First and foremost I would like to wholeheartedly thank my supervisors Dr. Martin Anson and Dr. David Veale for their continued support and encouragement in developing my main research project. Indeed I would also like to thank them for the opportunity to co-facilitate The Priory Hospital Body Dysmorphic Disorder (BDD) support group. This opportunity was a rewarding way to learn about and reflect on the phenomenology of BDD. In turn I extend my gratitude to all the participants who gave their time to help us gain more insight into the topic of the thesis project.

Other professionals who I wish to acknowledge include Prof. Dave Hemsley and Dr. Jane Hutton. Prof. Hemsley is acknowledged for his helpful comments on an initial draft of the project's proposal. Dr. Hutton is acknowledged for strengthening my interests in the treatment of body image problems while she supervised me on a clinical health psychology placement at King's College Hospital. I would also like to acknowledge the support of Dr. Sebastian Potter who supervised my service evaluation project at the Lishman Brain Injury Unit (South London and Maudsley NHS Foundation Trust) and to thank Sian Fitzpatrick, Anna Isherwood and Linda Horrell who contributed to data collection.

I would like to thank the DClinPsy 2009-2012 cohort, to which I belong, for their support and especially for their humour throughout our time studying together. A warm thank you to Olli, Kristen, Erin, Rachel, Fergus, Catherine, Heather, Kylie, Kasper, Sunil, Khodayar, Chinae, Federica, Kate, Helen, Marc, Cara, Lizzy, and Vickie. Last but not least I acknowledge the continued support that my family have given me, as they always do, throughout my studies.

I chose to investigate BDD for my main thesis project because this disorder was not covered in the DClinPsy lecture/workshop programme that I attended from October 2009. After speaking to Dr. Anson it became apparent that there was indeed scope for an experimental project to run alongside recruitment for a treatment trial being carried out at the Centre for Anxiety Disorders and Trauma (CADAT; SLAM NHS Foundation Trust). Furthermore, I soon learnt that BDD is still under-researched and so I hoped to contribute to filling this gap in the clinical psychology literature.

Dedicated to the memory of: Richard James Turner (1984-2011).

An up and coming jazz trumpeter and
venue host whose presence on the London jazz scene
was truly noted. A dear friend who is missed.

Part 1: Main Research Project

Title: Self-Focused Attention and Appearance-Related Comparisons in Body Dysmorphic Disorder

Trainee Clinical Psychologist: Mark A. Turner

First Supervisor: Dr. Martin Anson

Second Supervisor: Dr. David Veale

Part 2: Service Evaluation Project

Title: Reliable Digit Span as an indicator of effort in outpatients with Traumatic Brain Injury

Trainee Clinical Psychologist: Mark A. Turner

Supervisor: Dr. Sebastian Potter

Part 1: Main Research Project

**Title: Self-Focused Attention and Appearance-
Related Comparisons in Body Dysmorphic
Disorder**

Trainee Clinical Psychologist: Mark A. Turner

First Supervisor: Dr. Martin Anson

Second Supervisor: Dr. David Veale

Abstract

Background: Self-focused attention (S-FA), appearance-related comparisons (A-RCs) and self-serving appearance-related biases are relevant to cognitive-behavioural models of, and therefore distress maintenance in, BDD despite them being under-researched. To the author's knowledge, there are no previous published investigations looking at the nature and specificity of A-RCs, beliefs held about the functions of A-RCs, or experiments investigating self-serving A-RCs biases in people with BDD relative to healthy controls. It was also felt that a more fine grained investigation of self-esteem looking at self-competence and self-liking in people with BDD was warranted.

Hypotheses: Hypothesis 1 explored the nature (frequency, direction (attractiveness of A-RCs targets) and automaticity) of A-RCs. More frequent, generally more upwards (to more attractive others) and more automatic A-RCs were hypothesised in people with BDD relative to healthy controls. Hypothesis 2 explored the specificity of A-RCs in people with BDD relative to healthy controls. It was hypothesised that the more frequent A-RCs would not be attributable to more general constructs related to comparing. Beliefs about the functions of A-RCs in people with BDD relative to healthy controls were also explored. Hypothesis 3 investigated a self-serving A-RCs bias, hypothesising that healthy controls, but not people with BDD, would hold this sort of bias contingent on S-FA. Hypothesis 4 investigated self-esteem, hypothesising that self-liking would be disproportionately lower than self-competence in people with BDD relative to healthy controls.

Method: 23 people with BDD (10 females, 13 males) and 20 healthy controls (10 females, 10 males) matched approximately on age and sex were recruited while using rigorous screening criteria. Hypotheses 1 and 2 used standardised and newly devised questionnaires to explore A-RCs in people with BDD relative to healthy controls. Hypothesis 3 was tested (BDD, n=22; healthy controls, n= 20) using a novel mixed experimental design to investigate the self-serving A-RCs bias, which included employing a manipulation of implicit S-FA as a repeated-measures variable. Hypothesis 4 used the well-established Rosenberg Self-Esteem Scale, divided into self-competence and self-liking, to look at the extent of between group differences.

Results: Hypothesis 1 was fully supported. A-RCs were significantly more frequent, generally more upwards, and more automatic in people with BDD relative to healthy controls. Hypothesis 2 was also fully supported. The significantly higher frequency of A-RCs in people with BDD, relative to healthy controls, could not be attributed to general social comparison orientation, upwards social comparison orientation, or self-esteem. People with BDD also held significantly stronger agreement with beliefs about A-RCs as serving functions of self-evaluation, self-loathing (a way to confirm beliefs about physical unattractiveness) and social threat management relative to healthy controls. Hypothesis 3 was not supported, with no A-RCs bias, contingent on S-FA, being found in healthy controls or people with BDD. Hypothesis 4 was also not supported with both self-competence and self-liking being found to be significantly and equally lower in people with BDD relative to healthy controls.

Discussion: The author discusses results with particular reference to the theory of social comparison processes as well as literature on clinical anxiety and cognitive-behavioural models of BDD. The discussed limitations of the present investigation include the absence of a clinical control group, not matching groups on objective attractiveness, and the study's ecological validity. Clinical implications cover suggested guidance for addressing A-RCs in cognitive-behavioural therapy and with mindfulness. More comprehensive investigations of A-RCs biases in people with BDD are covered as future directions for research.

Key words and abbreviations: Body Dysmorphic Disorder, BDD; Self-focused attention (S-FA), appearance-related comparisons (A-RCs), self-serving A-RCs bias.

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1.0 Introduction

1.1 Literature review

1.1.1 Diagnosis of Body Dysmorphic Disorder (BDD)

Body Dysmorphic Disorder (BDD) is defined in DSM-IV as a preoccupation with an imagined or slight defect in appearance, resulting in significant distress or impairment in social, occupational, or other important areas of functioning (American Psychiatric Association, [APA] 2000). The preoccupation should not be better accounted for by another mental disorder such as the dissatisfaction with body shape and size found in anorexia nervosa (APA, 2000). The preoccupation in BDD should be for at least one hour per day (Phillips, 1996a). The content of this preoccupation however as defined as an *imagined* or *slight* defect in appearance can be problematic to diagnose and confusing or vexing for patients under assessment given that they tend to perceive the ‘defect’ as ugly, unsightly or disfigured for example. A suggested revision to the preoccupation criterion has therefore been proposed for the DSM-V as a “Preoccupation with a perceived defect(s) or flaw(s) in physical appearance that is not observable or appears slight to others.” (Phillips et al., 2010, p.578). This revision would more accurately reflect the phenomenology of BDD by focusing on a discrepancy between the concern of the person with BDD and the general views of others. The inclusion of the word flaw(s) in addition to defect(s) might also be more suitable to some patients if defect is considered a too harsh a term (Phillips et al., 2010). The proposed revision to the preoccupation criterion is therefore likely to be more helpful to therapeutic engagement.

BDD is classified as a somatoform disorder in the DSM-IV and a hypochondrical disorder called “dysmorphophobia” in the ICD-10 (APA 2000; World Health Organisation, [WHO] 1992). The DSM-IV diagnosis of BDD however is preferred by experts in the field and is therefore focused on here (Veale & Neziroglu, 2010).

The significant distress or impaired functioning criterion is what distinguishes more common presentations of body dissatisfaction expressed in therapy from a full diagnosis of BDD (Castelnuovo-Tedesco, 1992). It has been shown that a larger

proportion of people with BDD meet the distress criterion (90%) as compared to that of impaired functioning (51%) (Koran, Abujaoude, Large, & Serpe, 2008). Beliefs about appearance in BDD that are held with poor insight are referred to as overvalued ideas in the DSM-IV. When such beliefs are of a delusional level of conviction an additional DSM-IV diagnosis of a delusional disorder can be given although the clinical utility of this is highly questionable (Veale & Neziroglu, 2010). BDD is commonly under- or mis-diagnosed for a multitude of reasons (Buhlmann, 2011; Buhlmann, Greenberg, & Wilhelm, 2011). People with BDD might not voice their appearance concerns unless specifically asked by their physician owing to feelings of shame or embarrassment (Grant, Kim, & Crow, 2001; Conroy et al., 2008). Clinicians might not assess for BDD if anorexia nervosa seems more relevant owing to the hierarchical approach to diagnosis in the DSM-IV (Grant & Phillips, 2004). The disorder's frequent presentation in less psychologically minded settings might also contribute to the inadequate diagnosis of BDD (e.g. Phillips, Grant, Siniscalchi, & Albertini, 2001; Crerand, Menard, & Phillips, 2010). The age of onset for BDD is typically during early adolescence (Phillips & Diaz, 1997; Phillips, Didie, Menard, Pagano, Fay, & Weisberg, 2006), although the diagnosis of BDD is usually much later.

1.1.2 BDD as an obsessive-compulsive spectrum disorder

While having some commonalities with the affective spectrum, BDD has been proposed as belonging to the obsessive-compulsive spectrum (Phillips, McElroy, Hudson, & Pope, 1995; Phillips, 2002). The main preoccupation with appearance has indeed been deemed as obsessional and it can lead to both repetitive and avoidance behaviours as described below (Phillips, 2002; Greenberg & Wilhelm, 2011).

1.1.3 The clinical features of BDD

Appearance-related preoccupation in BDD

People with BDD are frequently preoccupied with more than one area of their body (Phillips, McElroy, Keck, Pope, & Hudson, 1993). Parts of the face and head are the most commonly reported, such as the skin, hair, and nose, although any part of the body can be the focus of concern (Phillips & Diaz, 1997; Phillips et al., 1993; Veale,

et al., 1996). Indeed, in descending order, the skin (80%), head hair (57.7%), and nose (39%) were the most commonly reported lifetime body areas of excessive concern in a study of 200 people with BDD; the lifetime mean number of body areas of excessive concern was 5–7 (Phillips, Menard, Fay, & Weisberg, 2005). In addition to the presentation of intense preoccupation with specific body areas, 29% of people with BDD were recently shown to have more general weight concerns. This BDD group were more likely to be young, female, have a high number of body areas of concern and have greater body image disturbance, amongst other clinically pertinent variables (Kittler, Menard, & Phillips, 2007).

Appearance-related processes in BDD

People with BDD often engage in rumination about their appearance (Veale, 2004), and another behavioural process often found as a feature of BDD is appearance-related comparing (Phillips, 2005; Cororve & Gleaves, 2001; Veale, 2004). People with BDD have reported spending a lot of time comparing their body areas of concern to the same area in others (Anson, 2008). Appearance-related comparing forms a key aspect of the present study and is returned to later.

Appearance-related behaviours in BDD

As in other anxiety disorders, people with BDD engage in both avoidance and “safety seeking behaviours” (SSBs) which are designed to reduce the likelihood of their feared outcomes occurring (e.g. Clark & Wells, 1995; Salkovskis, 1999; Veale, 2004). SSBs in BDD include camouflaging with clothing, or a particular hair style (Phillips et al., 1993). People with skin preoccupations are also likely to camouflage with make-up and to engage in pathological skin-picking (Grant, Menard, & Phillips, 2006; Phillips, & Taub, 1995). SSBs in BDD also include changes in posture, not allowing others to see the body from certain angles and the use of clothing/jewellery as a distraction (Veale, De Haro, & Lambrou, 2003).

People with BDD often experience marked anxiety in social situations owing to social-evaluative concerns (Pinto & Phillips, 2005; Coles et al., 2006). As a consequence, avoidance of both social and occupational situations is common in people with BDD, and this might well result in them becoming housebound (Phillips et al. 1993; Phillips, Didie, Menard, Pagano, Fay, & Weisberg, 2006).

A large majority of people with BDD report excessively checking their appearance in mirrors and other reflective surfaces for up to four hours per day with some periodic avoidance. Others have reported the avoidance of mirrors/ reflections, and of other potential appearance related triggers such as magazines and television (Phillips et al., 1997; Phillips et al., 1993). In particular some people with BDD report that mirror-gazing is too time-consuming or distressing (Veale & Riley, 2001). Some have also reported subtle tactile sensations such as facial tightness, preoccupation with concerns around the fragility of a facial feature, and excessive reassurance seeking (Phillips et al., 1993; Phillips et al., 1995).

Other behaviours however can be long lasting, permanent, and dangerous owing to attempts to correct or enhance appearance. The use of tanning, appearance enhancing medical treatments (e.g. cosmetic surgery, dermatology and dental work) and “do it yourself” surgery have all been reported (Phillips et al., 1996; Phillips et al., 1993; Sarwer, & Crerand, 2008; Veale, 2000). Those who are treated medically rarely experience improvements and often endure an increase in their symptoms (Sarwer, & Crerand, 2008; Phillips et al., 1997; Phillips et al., 1993). Moreover, postoperative dissatisfaction has been found in 76% of 25 people with BDD who were currently presenting for psychiatric assessment and who reported having had a total of 46 procedures between them. Most people in the study had multiple concerns with their appearance and it was reported that 50% of procedures resulted in a transfer of the main body area of preoccupation (Veale, 2000). Repeated operations and rhinoplasty led to the worst outcome whereas mammoplasty and pinnaplasty were associated with higher levels of satisfaction.

Appearance-related insight in BDD

Many people with BDD have also reported ideas or delusions of reference associated with their defect (Phillips et al., 1993). Furthermore, insight is usually poorer in BDD than in related disorders although a continuum ranging from insightful to delusional has still been observed (Eisen, Phillips, Coles, & Rasmussen, 2004; Phillips, 2004; Phillips, Menard, Pagano, Fay & Stout, 2006; Jakes & Hemsley, 1996). Research has highlighted that people with delusional and non-delusional BDD do not differ on a large range of variables (Phillips et al., 1994; Phillips et al., 2006). These variables have included demographic details, characteristics of the disorder, most measures of

functional impairment and quality of life, comorbidity (for both axis I and II disorders), family history, probability of remission over a one year follow-up and treatment response to Serotonin-Reuptake Inhibitors (Phillips et al., 2006; Phillips & McElroy, 1993). Phillips et al. (2006), however, found that a delusional BDD group had significantly lower educational achievement, a higher rate of attempted suicide, some evidence of poorer social functioning, a higher rate of lifetime drug abuse and dependency, more severe BDD symptoms, and were less likely to be receiving mental health treatment. BDD symptom severity however was found to account for these differences, with the exception of educational achievement, adding weight to the view that delusional and non-delusional groups are presentations of the same disorder at differing levels of severity (Phillips et al., 1994; Phillips & McElroy, 1993; Phillips et al., 2006).

Appearance-related standards and over-valued ideas in BDD

People with BDD have been found to hold high aesthetic standards and overvalued ideas about the importance of attractiveness (Lambrou, Veale, & Wilson, 2011; Veale & Lambrou, 2002; Veale, 2002). Veale (2002) proposed that the self in BDD is defined by its aesthetic qualities/ as an aesthetic object. The idealised values associated with this processing of the self were unsurprisingly reported to be about appearance but in some people with BDD they were also reported as relating to social acceptance.

1.1.4 Prevalence of BDD

BDD has been found to have a lifetime prevalence of 1.1% in a community setting whereas its point prevalence has been shown to be 1.7% to 4.9% of the population (Bienvenu et al., 2000; Rief, Buhlmann, Wilhelm, Borkenhagen, & Brähler, 2006; Buhlmann et al., 2010; Koran, Abujaoude, Large, & Serpe, 2008; Boroughs, Krawczyk, 2010). In certain healthcare settings however, such as cosmetic surgery and dermatology, the prevalence is higher. It has been estimated that 5%-15% of patients presenting for appearance enhancing medical treatments suffer from BDD (Crerand, Franklin, & Sarwer, 2006; Sarwer & Crerand, 2008). In cosmetic surgery samples a rate of 7% was reported in an American study whereas rates from 3.2% to 16.6% have been reported in recent international studies (Sarwer, Wadden,

Pertschuk, & Whitaker, 1998; Vulink et al., 2006; Aouizerate, et al., 2003; Bellino et al., 2006). In dermatological clinic settings prevalence rates of 8.5% to 11.9% have been identified (Vulink et al., 2006; Phillips, Dufresne, Wilkel, & Vittorio, 2000). The rate of BDD in adult inpatient settings is also high with reports ranging from 13.1% to 16% (Grant, Kim, & Crow, 2001; Conroy et al., 2008). The prevalence of BDD has been found to decrease after the age of 44 years however (Koran et al., 2008). The prevalence rate of BDD is clearly dependent on the healthcare setting studied (Crerand, Franklin, & Sarwer, 2006). The influence of the country and culture of study, and the assessment method used, is not well established.

1.1.5 Quality of life in BDD

Scores on all domains of mental health-related quality of life, as measured by a common quality of life measure, were found to be poorer in people with BDD as compared to norms from groups of patients with depression, diabetes mellitus, or a recent myocardial infarction. More severe BDD symptoms and greater delusionalism were also associated with poorer mental health-related quality of life and social functioning after controlling for depression severity (Phillips, 2000). More recently, in a prospective study design, BDD symptom severity was shown to be a significant predictor of poorer psychosocial functioning (Phillips, Quinn, & Stout, 2008). More delusional BDD symptoms were not a significant predictor of such functioning once symptom severity had been controlled for however. This study also showed that psychosocial functioning was both poor and stable during a 3 year follow-up period.

People with BDD have also been shown to score more poorly compared to people with eating disorders on a measure of the effects of body image disturbance on several areas of psychosocial functioning and well-being (Hrabosky et al., 2009). It has also been noted that people with BDD might have few friends and a restricted social life due to avoidance (Veale & Neziroglu, 2010).

1.1.6 Suicidality in BDD

A history of suicidal ideation owing primarily to BDD has been found to be 45%-70% in cohorts studied in cross-sectional/retrospective studies (Perugi et al., 1997;

Phillips, McElroy, Keck, Hudson, Pope, 1997). The rates of past suicide attempts in people with BDD have been reported as 22%–24% (Veale et al., 1996; Phillips & Diaz, 1997). In addition, a 4 year prospective study found that 2.6% of a cohort of 185 participants with BDD attempted suicide per year (Phillips & Meynard, 2006). The completed suicide rate for this BDD cohort was 0.3% which was documented as 45 times higher than that of the general population.

1.1.7 Demographics in BDD

The current estimated prevalence rates of BDD have been slightly higher in women (1.9%-2.5%) than in men (1.4-2.2%) (Rief et al., 2006; Koran et al., 2008; Buhlmann et al., 2010). BDD has been found to have more similarities than differences between the sexes (Phillips & Diaz, 1997; Perugi et al., 1997; Phillips, Menard, & Fay, 2006). In this latter study by Phillips et al. (2006), which had the largest cohort and broadest inclusion and exclusion criteria, females were found to have a significantly greater number of current body areas of concern compared to males. More females were dissatisfied with their skin, stomach, weight, breast/chest, buttocks, thighs, legs, hips, toes, and body/facial hair. More males however were dissatisfied with their genitals, had concerns that their body build was too small/ poorly muscled, and that their head hair was thinning/balding.

Furthermore more males were found to lift weights excessively, to have a substance use disorder, and to be more functionally impaired. More women however were found to have had repetitive and safety behaviours, an eating disorder, and an earlier onset of subclinical BDD.

It has also been shown that people with BDD are likely to be unemployed and that a high proportion of this population are single, separated, or never married (Perugi et al., 1997; Phillips, McElory, Keck, Hudson, & Pope, 1994;; Koran, et al., 2008). Another study showed that a BDD group were of lower social class than a healthy control group and a rhinoplasty waiting-list group (Thomas & Goldberg, 1995). In this study less than half of the BDD group had this disorder as their primary diagnosis however. It has also been shown that dropping out of school is common

due to BDD amongst a cohort of younger people with this diagnosis (Albertini & Phillips, 1999).

1.1.8 Comorbidity in BDD

In BDD co-morbidity is very common, with a mean of more than two lifetime axis I comorbidities (Gunstad & Phillips, 2003). In terms of both current and lifetime co-morbidity rates, major depressive disorder (MDD), social phobia (SP), and obsessive-compulsive disorder (OCD), have been reported as the most common (Veale et al., 1996; Zimmerman & Mattia, 1998; Gunstad & Phillips, 2003; Phillips & Diaz, 1997).

A large range of other current and lifetime co-morbidities have been reported including dysthymia, bipolar disorder, eating disorder, and substance use disorders including alcohol and non-alcohol substance dependency and abuse (Phillips & Diaz, 1997; Zimmerman & Mattia, 1998; Gunstad & Phillips, 2003; Nierenberg et al., 2002; Grant, Kim, & Crow, 2001; Grant, Menard, Pagano, Fay & Phillips, 2005).

Gunstad & Phillips (2003), in the largest cohort study focusing on comorbidity in BDD, found the following prevalence rates: MDD: current, 58%, lifetime, 76%; SP: current, 32%, lifetime, 37%; and OCD: current, 25%, lifetime, 37%. The prevalence rate of current comorbid dysthymia in BDD has been reported to be 18% - 19% (Veale et al., 1996; Zimmerman & Mattia, 1998). Furthermore the larger cohort studies show the lifetime prevalence rate of dysthymia to be around 6-7% (Gunstad & Phillips, 2003; Phillips & Diaz, 1997). The prevalence rate of current comorbid bipolar disorder in BDD has been reported to be 5-6% although the reported lifetime prevalence rate of comorbidity has varied from 5%- 31% (Zimmerman & Mattia, 1998; Gunstad & Phillips, 2003; Perugi et al., 1997).

The prevalence rate of current comorbid eating disorder in BDD has been reported as 4%- 19% (Gunstad & Phillips, 2003; Zimmerman & Mattia, 1998) whereas the lifetime prevalence rate has varied from as much as 4% in Gunstad & Phillips (2003) to 10%- 22% in both older and smaller cohort studies (Phillips & Diaz, 1997; Perugi et al., 1997; Nierenberg et al., 2002).

The prevalence rate of current comorbid substance use disorder (SUD) in BDD has been reported as 2%- 17% (Veale et al., 1996; Grant et al., 2005). The lifetime prevalence rate of SUD comorbidity however appears to be much higher with reported prevalence rates from 22%- 48.9% (Hollander et al., 1993; Grant et al., 2005). The prevalence of both alcohol and at least some non-alcohol substance abuse disorders appears to be particularly high in the inpatient setting (Grant et al., 2001).

1.1.9 Treatment of BDD

In a large cohort followed up for 1 year BDD was shown to have a very low probability of remitting (0.09%) despite a large proportion (83.2%) of its participants receiving mental health treatment (Phillips, Menard, Pagano, Fay, & Stout, 2006). The course of BDD therefore appears to be chronic, highlighting a need for effective treatment. A recent review including 26 studies (including case reports, case series, open trials, controlled trials, and two meta-analyses) of cognitive-behavioural therapy (CBT) for BDD however showed that this mode of treatment is promising (Greenberg & Wilhelm, 2011). The review documented that CBT for BDD is associated with improvements in symptoms and associated features including functioning, depression, anxiety, and delusional beliefs. Furthermore, a meta-analysis showed that pharmacotherapy was not as effective as psychological therapies (Williams, Hadjistavropoulos, & Sharpe, 2006). A Cochrane collaboration meta-analysis of RCT designed studies more recently highlighted that BDD symptom severity can be significantly reduced with either serotonin reuptake inhibitors or CBT (Ipser, Sander, Stein, 2009). CBT also had some evidence of a low relapse rate. The authors also concluded that there is a need for replication in results. The most substantive evidence for CBT for BDD comes from two studies employing the randomised controlled trial (RCT) design. Both studies have highlighted that CBT for BDD is more effective than wait-list control (WLC) conditions (Rosen, Reiter, & Orsan, 1995; Veale, et al., 1996). It is interesting however that CBT and BT have been shown to have a similar effectiveness in terms of BDD severity outcome in a meta-analysis (Williams et al., 2006). The models that CBT is currently being based upon are now reviewed.

1.1.10 Cognitive-behavioural models of BDD

A number of cognitive behavioural models propose that, for a variety of reasons, people can develop preoccupations with negative views of their appearance (Cash, 2002, 2008; Neziroglu, Khemlani-Patel, & Veale, 2008; Veale, 2004; Veale & Neziroglu, 2010; Wilhelm, 2006). For example one cognitive behavioural model has applied both operant and classical (or evaluative) conditioning, social learning, and relational frame theory to highlight how vulnerable people develop and maintain symptoms of BDD (Neziroglu, 2004; Neziroglu, Roberts, & Yaryura-Tobia, 2004). In particular, early life praise for physical attributes and built associations between related aspects of appearance and negative affect owing to teasing/bullying have been suggested as relevant (Neziroglu et al., 2004; Neziroglu et al., 2008; Osman, Cooper, Hackman, & Veale, 2004).

Once negative views about appearance have developed Veale and Neziroglu's (2010) model of BDD asserts that a trigger situation, such as an external representation of appearance (e.g. a relevant intrusive thought, somatic sensation, or in comparing with another person's physical attractiveness) can lead to increased levels of self-focused attention. This increase in self-focused attention is said to heighten awareness of the "self as an aesthetic object". This concept of the self as an aesthetic object, in addition to including self-focused attention, is said to constitute beliefs about the importance of self-focused attention, mental imagery, and the lack of a self-serving appearance-related bias (Neziroglu et al., 2008; Veale & Neziroglu, 2010). Self-focused attention is viewed as being directed towards a distorted body image or "felt" impression of how one appears to others from an observer perspective (Veale, 2004; Osman, Cooper, Hackmann, & Veale, 2004). This image is proposed to be appraised negatively leading to understandable but ultimately maladaptive cognitive processes and behaviours such as selective attention, rumination, appearance-related comparisons, mirror-checking/gazing, SSBs, and avoidance. These cognitive processes and behaviours maintain preoccupation with negative beliefs and certain features, increase self-consciousness and awareness of negative imagery, and prevent disconfirmation of feared outcomes. Furthermore negatively appraised imagery, and the other abovementioned cognitive processes and behaviours, are said to result in changes in mood such as increased shame, anger and depression. These changes in

mood are also asserted to increase self-consciousness and awareness of negative imagery.

1.2 The present study

1.2.1 Rationale I

There is limited experimental research testing the models described above. In particular there is little research investigating self-focused attention and appearance-related comparisons in people with BDD despite their relevance to cognitive-behavioural models of the disorder. There is also a paucity of research on self-serving appearance-related biases in body image research generally and in BDD in particular. There is a need to study this given that there is some indication that people with BDD lack such biases (Lambrou, Veale, & Wilson, 2011). A detailed review of self-focused attention, social and appearance-related comparisons and evidence on self-serving biases in body image research is now presented. The review of these constructs is broad-based reflecting the scarcity of research on BDD. The review later prepares the reader for a subsequent focus on the second part of the present research's rationale along with its aims and hypotheses.

1.2.2 Self-focused attention (S-FA)

Definition of S-FA

Self-focus increases the availability of one's schematic representations of the self (Hull & Levy, 1979; Carver & Scheier, 1981). Self-focused attention (S-FA) has been defined as "an awareness of self-referent, internally generated information that stands in contrast to an awareness of externally generated information derived through sensory receptors" (Ingram, 1990b, p. 156). Research has demonstrated that S-FA increases the effects of schematic representations of the self on a wide variety of research tasks (Hull & Levy, 1979; Geller & Shaver, 1976). SFA is a "nonspecific process in psychopathology" found in many clinical disorders (Ingram, 1990b, p. 173; Woodruff-Borden, Brothers, & Lister, 2001; Mansell, Harvey, Watkins, & Shafran, 2008; see Clark & Wells, 1995 for an example). Ingram (1990b) referred to the dysfunctional aspect of maladaptive S-FA as self-absorption. He explained self-

absorption to be an excessive, sustained, and inflexible attention towards internal states even when an external focus would be more useful.

Conceptualisation of S-FA

It has recently been highlighted that S-FA¹ is most adequately conceptualised as a multifaceted psychological construct or a dynamic information processing operation (Mor & Winquist, 2002). Indeed the relationship between S-FA and negative affect is dependent upon the form it takes, the context, and the content of focus (Moberly & Watkins, 2008; Mor & Winquist, 2002). There is also some literature highlighting the more beneficial correlates of S-FA including self-knowledge and insight, self-regulation, and emotion regulation (McFarland, Buehler, von Ruti, Nguyen, & Alvaro, 2007). The notion of S-FA as multifaceted and contextually dependent therefore gives the concept greater construct validity for use in applied empirical testing (Pyszczynski, Greenberg, Hamilton, & Nix, 1991; Mor & Winquist, 2002).

Form of S-FA (rumination vs. reflection)

There are different forms of S-FA, such as rumination and reflection, which are likely to serve different functions (Treynor, Gonzalez, & Nolen-Hoeksema, 2003; Trapnell & Campbell, 1999). A ruminative form of S-FA is related to greater distress and pathology when it is more abstract, general, and decontextualised (Watkins, 2008). On the other hand, S-FA that is reflective, open-minded, and experiential including more concrete awareness of the present-moment is related with more adaptive outcomes (Watkins, 2008). There is also experimental work to show that

¹ Some literature conceptualises S-FA as trait-like and is therefore assessed by self-report in work that has often been correlational (e.g. Flory, Rääkkönen, Matthews, & Owens, 2000; Mor & Winquist, 2002). The present research concentrates on S-FA as a state vulnerable to momentary experimental manipulation following Schwinghammer, Stapel, & Blanton, (2006). Some literature on S-FA as a trait however is also referred to as this appears to be important when comparing clinical and non-clinical populations (Woodruff-Borden, Brothers & Lister, 2001; Mor & Winquist, 2002). The relationship between S-FA and negative affect tends to be often very similar for both trait and state S-FA assessed with correlational and experimental designs, respectively (Mor & Winquist, 2002). Neither the potential interaction between trait and state S-FA nor its possible relationship to other psychological variables has received much empirical research (Mor & Winquist, 2002).

this more experiential form of S-FA leads to reduced over-general memories but that more ruminative self-focus involving analytical thought about internal experiences does not (Watkins & Teasdale, 2004). It has also been shown that rumination on the self counteracts the more adaptive influence of reflection on the self (Takano & Tanno, 2009).

Potency of S-FA (less- more)

The content of S-FA can also be experienced with differing potency. Indeed general measures of psychopathology and severity are correlated with S-FA, with these correlations becoming more pronounced when isolating negative S-FA (Woodruff-Borden, Brothers & Lister, 2001). Woodruff-Borden et al. (2001) also found that a panic disorder group presented with more positive S-FA as compared to a depression group. This depression group however was found to have significantly less neutral S-FA than both the panic disorder group and an “other anxiety” group. There is also evidence that depression positively correlates with S-FA (Smith, Ingram, & Roth, 1985). The distorted internal body image that is proposed to exist in people with BDD has been found to be experienced more vividly, i.e. with a higher potency, as compared to in healthy controls (Veale, 2004; Osman, Cooper, Hackmann, & Veale, 2004).

Level of S-FA (Implicit vs. Explicit)

There are different levels of awareness and these have been usefully applied to cognitive-behavioural models of an anxiety disorder and more recently to BDD (Baars, 1997, 2005; Brewin, Dagleish, & Joseph, 1996; Ehlers & Clark 2000; Buhlmann, Teachman, Gerbershagen, Kikul, & Rief, 2008; Buhlmann, Teachman, Naumann, Fehlinger, & Rief, 2009; Buhlmann, Teachman, & Kathmann, 2011). S-FA is a psychological concept which exists at both explicit and implicit levels of awareness (Silvia & Phillips, 2012; Eichstaedt & Silvia, 2003). Rumination is an explicit focus on the self usually in terms of one’s mood and the reasons for this (Watkins, 2008). It therefore tends to be inextricably and overtly linked to affect. S-FA also appears to exist at a more implicit level of processing which appears to be less linked to affect (Mor & Winquist, 2002). S-FA at the implicit level however still appears to impact the processing of incoming information and this is particularly important for the present study (Schwinghammer, Stapel, & Blanton, 2006).

Context of S-FA (external & internal)

There are a number of contextual factors that influence the facets of S-FA that are induced. For example, Greenberg & Pyszczynski (1986) showed that S-FA was persistently high after failure and low following success thus highlighting the moderating role of situational context. Furthermore it has been both asserted in theory and empirically shown that following negative events S-FA is positively correlated with negative affect but that this is not the case following positive events (Pyszczynski & Greenberg, 1987; Mor & Winquist, 2002). Affective correlates of S-FA are therefore also dependent on situational context.

According to early models, S-FA is only unhelpful in the context of an unfavourable discrepancy between the perceived self and a relevant standard that the person is unable to minimise (Duval & Wicklund, 1972; Carver & Scheier, 1981, 1990). It has also been shown that the influence of experimentally manipulated ruminative S-FA on depressed mood interacts with negative self-beliefs (Ciesla & Roberts, 2007). Intrapersonal context can therefore also influence the affect that accompanies S-FA.

Content of S-FA (private vs. public & positive vs. negative)

In addition to the form, potency, and context of S-FA all being important it is clear that the content of what is focused on can differ (Ingram 1990a). Indeed the content of S-FA has been proposed to be disorder specific and evidence suggests that it influences its correlates (Ingram, 1990b; Mor & Winquist, 2002). For example, self-focus in which the content involves private self-aspects, such as thoughts, feelings and attitudes, is more strongly associated with depression and generalised anxiety, whilst self-focus in which the content involves public self-aspects, such as thoughts about others' reactions to what can be observed about the self (e.g. physical appearance), is more strongly associated with social anxiety (Mor & Winquist, 2002; for a review see Spurr & Stopa, 2002). In addition, as would be expected, focusing more on positive self-aspects is associated with lower negative affect although focusing more on negative self-aspects is associated with higher negative affect (Mor & Winquist, 2002; Sedikides, 1992a). The distorted internal body image that is proposed to exist in people with BDD, in addition to being experienced with a higher potency, has also been found to be appraised negatively, that is as a negative self-aspect, as compared to in healthy controls (Veale, 2004; Osman et al., 2004).

The valence of the content of S-FA also appears to differentially influence the processing of incoming information according to whether the self-aspect focused on is positive, negative or neutral², compared to no self-focus (Schwinghammer et al., 2006). Self-focus has been associated with increased social comparison and indeed information which is often attended to by people in general pertains to appearance-related comparisons (Duval, Duval, & Mulilis, 1992; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). People with BDD however, engage in appearance-related comparisons more often than healthy controls and they become a time consuming behaviour (Anson, 2008; Veale, 2004). Furthermore, comparisons have been related to higher levels of body dissatisfaction and so their role in the maintenance of BDD is worth inquiry (Myers & Crowther, 2009).

1.2.3 Appearance-related comparisons (A-RCs)

Festinger's theory of social comparison processes

Festinger (1954) proposed that there is a drive for people to engage in a process of both opinion- and ability-related social comparing in order to obtain personally relevant and important information for self-evaluation. Festinger's theory of social comparison processes also states that, where possible, people will use objective, non-social means (i.e. from the physical world) for such evaluations. The theory states that such information is often not accessible however and consequently it is asserted that evaluations of some self-relevant information rely on social comparisons with other people. More recent developments suggest that these subjective social comparisons are made even when objective information is available however (Marsh & Parker, 1984; Ruble, 1983). The following sections describe research on A-RCs in the context of some of the main tenets of Festinger's theory.

² Schwinghammer et al. (2006) refer to these as positive, negative and neutral self-activation. The author deems their positive and negative self-activations to be equivalent to what Mor & Winkvist, (2002) refer to as focusing on positive and negative self-aspects. The author deems their neutral self-activation to be the same as what is referred to as self-focused attention (S-FA) throughout the text.

Direction of A-RCs (upwards vs. downwards)

A-RCs, like social comparisons more generally, can put the self in better or worse perceived standing relative to the target of comparison (Tiggemann & Polivy, 2010; Gibbons & Buunk, 2000). For abilities but not opinions Festinger (1954) asserted that there is a drive towards making comparisons more so to those who are perceived as slightly more able. This orientation towards “upwards comparisons” is said to be owing to a value-based desire to do better, despite the existence of strong limitations on what can be achieved in trying to improve in an ability³. There is indeed evidence that people tend to make more frequent upwards as compared to downwards A-RCs (Anson, 2008). Research has also shown that A-RCs to physically attractive others reduce self-evaluations (which were mainly but not entirely about physical attractiveness) more so than A-RCs to unattractive others (Trampe, Stapel, & Siero, 2007). Furthermore, upwards A-RCs have been shown to predict lower appearance-evaluations whereas downwards A-RCs have been shown to predict higher appearance-evaluations in the development of new A-RCs scales (O’Brien et al., 2009). Upwards A-RCs have also been associated with increased negative affect and body dissatisfaction (Leahey, Crowther, & Mickelson, 2007; Engeln-Maddox, 2005; Bailey & Ricciardelli, 2010).

Target of A-RCs (particularistic vs. universalistic)

There is some assertion that targets of comparison are most frequently chosen for being relatively similar in their opinion, or in the ability, which is being evaluated for subjectively accurate self-evaluations (Goethals & Darley, 1977; Suls, Martin, & Wheeler, 2000; Festinger, 1954). Making social comparisons to others generally has been called universalistic comparisons. Making social comparisons to those who share a certain bond or identity however have been called particularistic comparisons (Miller, Turnbull, & McFarland, 1988). This distinction has also been applied in the body comparison literature with particularistic comparisons leading to greater body image anxiety and distress (Heinberg & Thompson, 1992a; Heinberg & Thompson, 1992b). Furthermore, Cash, Cash, & Butters (1983) found that women exposed to

³ The physical restraints on what can be changed or altered in appearance can be said to mirror what Festinger (1954) wrote about their being strong limitations on what can be achieved in trying to improve in a certain ability.

photos of physically attractive women rated their own physical attractiveness lower compared to women who viewed the same photos with the added information that they were of professional models. This result was more recently replicated for self-evaluations largely about physical attractiveness and appearance satisfaction again in women (Trampe, Stapel, & Siero, 2007). Frazoi & Klaiber (2007) used groups of Olympic athletes, professional models and college students to investigate who people target in A-RC. It was shown that members of each group reported most frequently comparing their bodies to people from their own group. Furthermore, it has been shown that people with BDD and healthy controls more often compare their appearance to same sex others relative to those of the opposite-sex (Anson, 2008).

Frequency of A-RCs (low- high)

In keeping with the above Festinger's theory implies that in the general population when other people are judged as significantly discrepant from oneself, in terms of physical attractiveness, A-RCs will cease and hence reduce in frequency. When an ability or opinion is perceived as important, such as appearance in people with BDD, the pressure or drive towards reducing discrepancies in self-evaluation is also said to increase (Festinger, 1954). Festinger (1954) also wrote that the usual cessation of comparing to those who are largely discrepant is not seen when the desire to belong to a group is particularly marked. It therefore follows that one would continue to make unfavourable comparisons to those perceived as much more attractive when physical appearance is highly valued. This above pattern clearly fits with the phenomenology of BDD given time consuming A-RCs, including to those deemed more attractive, in the context of the over-valued ideation about physical appearance found in this disorder (Veale, 2004; Anson, 2008; Veale, 2002).

Automaticity of A-RCs (low- high)

Recent research has shown that social comparisons including A-RC are automatic processes that naturally occur (Mussweiler, Rüter, & Epstude, 2004; Want, 2009; Leahey, Crowther, & Mickelson, 2007). It is interesting that body dissatisfaction has also been shown to increase access to self-related cognitions which in turn has been shown to increase social comparison tendencies (Trampe et al., 2009; Stapel & Tesser, 2001). Higher frequencies of more automatic A-RC might therefore be expected in people with BDD relative to healthy controls.

A-RCs and body dissatisfaction

A-RCs appear to lead to dissatisfaction with one's own physical appearance and mediate the relationship between exposure to appearance-related information and depressive symptoms (Myers & Crowther, 2009; Bessenoff, 2006). Despite research coming mainly from samples of women A-RCs have been found to predict body dissatisfaction in men (Karazsia & Crowther, 2009). Women with higher levels of body-dissatisfaction report engaging in a higher frequency of A-RCs relative to women who are satisfied with their bodies (Trampe et al., 2007). Furthermore Trampe et al. (2007) showed that self-evaluations in body-dissatisfied women were similarly low in body-dissatisfied women who were exposed to attractive models or attractive non-models. In body- satisfied women however the usual greater influence of particularistic targets of comparison (the attractive non-models) was seen. It is also of note that body-dissatisfied women have been found to engage in a greater proportion of upwards A-RCs relative to body-satisfied women (Leahey et al., 2007). It is also interesting that Trampe et al. (2007) showed that body dissatisfaction increased self-focus which has been suggested to increase engagement with social comparisons as well as strengthen the effect of A-RCs (Stapel & Tesser, 2001; Schwinghammer et al., 2006).

A-RCs and body image disturbance

Theories of body image disturbance propose that A-RCs are a core factor in the development and maintenance of distorted body image (e.g. Stormer and Thompson, 1996; Cash, 1997). It has been shown in a sample of women that A-RCs are more distressing for people who have lower self-evaluated physical attractiveness (Patrick, Neighbors, & Knee, 2004). A-RCs in people with BDD are also likely to be self-defeating. The selective attention to mental imagery and possible reliance on the processing of detail in faces and in memory recall in BDD might impede the attainment of an accurate view of the comparison target (Neziroglu et al., 2008; Feusner, Townsend, Bystritsky, & Bookheimer, 2007; Deckersbach, et al., 2000). Furthermore, the excessive S-FA towards a distorted perception of body image in BDD is likely to create a self-defeating point of reference (Veale, 2004; Rosen, 1995). The result of these processes is likely to be a higher frequency of upwards A-RCs which maintain distress.

1.2.4 Self-serving body-image bias research

It is interesting that research in disorders of body image disturbance has focused on finding evidence of distortions in body perception. Crisp & Kalucy (1974) studied Anorexia Nervosa (AN) with this aim and found overestimations of body widths although no control group was included in their first study. Their second study found that a control group of females exaggerated their body size almost as much as the AN group. This control group however were not screened for previous fluctuations in weight or size and this was later discovered in most. Other studies have been better designed by taking into account the role of actual body size in size estimation with matched group designs or with appropriate statistical techniques in meta-analysis; findings however have remained contradictory (Penner, Thompson, & Covert, 1991; Smeets, Smit, Panhuysen, & Ingleby, 1998).

More recently, research has moved in the direction of looking for the presence or absence of self-serving biases in body image. Indeed it has emerged that healthy controls hold a self-serving body-image bias in their perceptions of how attractive their bodies are relative to more objective ratings from a panel of judges (Jansen, Smeets, Martijn, & Nederkoorn, 2006). This self-serving bias/ or “rose-tinted glasses⁴” perspective however was absent in what they referred to as eating-symptomatic participants with this group’s views being more consensual with the more negative yet objective ratings of attractiveness from the panel (Jansen, et al., 2006). There was also a significantly stronger consensus for which specific body parts were deemed unattractive between the panel from study two and the eating-symptomatic participants, as compared to with the healthy controls.

⁴ It is interesting that a qualitative account of BDD focusing on perceptions of self across the life course, which have been called “temporal-self comparisons” have shown a different angle on what might be called “rose tinted glasses” of a more unhelpful nature (Silver & Reavey, 2010; Wilson & Ross, 2000). Silver & Reavey (2010) reported that participants with BDD appeared to perceive their past self as excessively attractive. This set of rose-tinted glasses is not necessarily self-serving for people with BDD and is more likely to be highlighting another maintenance factor of distress.

People with BDD have been found to display significantly larger discrepancies between how they perceive themselves to look and both how they would like to look in an ideal world and how they think they should look, compared to health controls (Veale, Kinderman, Riley, & Lambrou, 2003). The exact source of such differences in discrepancies however was not established. The source could have been a lower or more accurate self-evaluated physical attractiveness relative to the healthy control participants. A more accurate self-evaluated physical attractiveness in people with BDD, as found by Thomas & Goldenberg (1995), would have been evidence of a lack of a self-serving bias. The source could have also been an exaggerated ideal for their level of physical attractiveness relative to healthy controls in keeping with research on perfectionist standards in people with BDD (Buhlmann et al., 2008). This conundrum was later addressed by Lambrou, Veale, & Wilson (2011). These researchers showed that people with BDD were not disturbed in their perceptual processing of their own faces. Indeed, and crucially, it was demonstrated that people with BDD had a lack of a self-serving bias regarding their own facial attractiveness relative to the healthy controls (Lambrou et al., 2011). It is worth noting however that people with moderate BDD were the most accurate in perceptions of their own facial attractiveness whereas people with severe BDD showed the greatest negative distortion in such perceptions.

A-RCs bias

Along a similar theme of self-serving biases Schwinghammer et al. (2006) have emphasised the impact of self-focused attention (S-FA) on the way social (appearance-related) comparison information enters into a process of self-defence⁵: When participants were implicitly self-focused, “threatening” social comparison information (a photo of an *attractive* student) was processed in a self-serving manner. That is, favourable self-evaluations of attractiveness were made and the target of comparison was rated more negatively, as compared to in the absence of such self-focus. (See appendix 1 for the relevant figures from Schwinghammer et al., 2006). Thus, their findings showed that S-FA promoted self-serving processing of appearance-related comparison information. In short, this study found that healthy participants (female students), when comparing, rated their own appearance more

⁵ What the author calls a self-serving appearance-related comparing bias”

favourably and that of others less favourably under conditions of S-FA (Schwinghammer et al., 2006). This finding suggests the presence of a self-serving appearance-related comparing bias in healthy controls.

1.2.5 Functions of A-RCs

To the author's knowledge there is currently no published research data on the function (i.e. *why*) people with BDD engage in A-RCs. One suggestion is that comparing serves to reassure people with BDD that their perceived defect is not as noticeable as what they think (Rosen, 1995). Reassurance seeking has been found to be counterproductive however in both anxiety disorders and depression (e.g. Salkovskis, 1999; Joiner, Metalsky, Katz, & Beach, (1999). Social comparing can also be driven by a need to enhance or improve ourselves (Gibbons & Buunk, 1999). Moreover, comparing has been emphasised as a way to fulfil a need to maintain and protect self-esteem in a somewhat more defensive manner (Aspinwall & Taylor, 1993). The Schwinghammer et al. (2006) study mentioned above interpreted their findings as illustrative of an apparent need to protect self-esteem which was heightened under the conditions of implicit S-FA as compared to in the control attention condition. Furthermore these researchers proposed that this need to protect self-esteem was particularly marked when social comparison conditions were asserted to be more threatening to the self with the use of an upwards appearance-related comparison target. These findings suggest that A-RCs can have a self-serving function in addition to the self-evaluative function originally proposed by Festinger (1954). In keeping with social comparisons more generally, other possible functions of A-RCs are self-enhancement and self-improvement (Gibbons & Buunk, 1999). More detail on the literature covering the functions of social comparisons and A-RCs can be found in section 2.7.13 of this thesis. Section 2.7.13 describes the development of subscales on beliefs about the functions of A-RCs in people with BDD and healthy controls.

1.2.6 Specificity of A-RCs in BDD (specific?)

To date it has not been shown if A-RCs are the only form of social comparison that people with BDD engage in to a greater extent relative to healthy controls. It is

possible that A-RCs are found more abundantly in people with BDD relative to healthy controls owing to a more general picture of higher social comparison orientation (Gibbons & Buunk, 1999). There is evidence for example that people with Anorexia Nervosa, another disorder characterised by body dissatisfaction, endorse significantly higher levels of negative social comparisons relative to student controls in domains other than physical attractiveness (Troop, et al., 2003). Furthermore, it has been shown that people with low self-esteem, who have self-concepts which are characterised by less clarity or certainty, are particularly interested in social comparison, and more specifically upwards social comparison, as a form of self-evaluation (Campbell, 1990; Wayment, & Taylor, 1995). It is therefore also possible that A-RCs are found more abundantly in people with BDD relative to healthy control participants owing to a more general picture of a greater social comparison orientation or to a lower self-esteem. This area of investigation is important because cognitive-behavioural models need to be as disorder specific as possible in order for effective treatment to follow.

1.2.7 Self-esteem in BDD

One outcome of social comparing is lower self-esteem (Bessenoff, 2006). Self-esteem has been defined as the degree to which the self is judged as competent in life domains that are perceived as important (James, 1890/1983). Both body image disturbance and indeed BDD in particular have been shown to be associated with low self-esteem (Biby, 1998; Böhne, Wilhelm, Keuthen, Florin, Baer, & Jenike, 2002; Phillips, Pinto & Jain, 2004). Low self-esteem at an implicit level of awareness has also been shown to exist in people with BDD relative to healthy controls (Buhlmann, Teachman, Gerbershagen, Kikul, & Rief, 2008). In this study low implicit self-esteem was also associated with low explicit self-esteem. Low self-esteem in people with BDD is unsurprising given that reports have shown them to endorse equating unattractiveness or a defective appearance with being inadequate/ worthless and having a lonely/isolated future (Veale et al., 1996). Reports also show that people with BDD are often convinced that the only avenue to an improved self-esteem is to improve their appearance (Rosen, 1995). Recent research has also exposed the more latent beliefs that people with BDD have about physical attractiveness being more strongly associated with competence relative to healthy controls (Buhlmann,

Teachman, Naumann, Fehlinger, & Rief, 2009). This result corroborates the contingency of self-esteem on physical appearance that appears to exist in people with BDD.

Recent research however has proposed that self-esteem, despite a strong literary consensus on its unidimensional nature, can be divided into the interdependent constructs of self-competence and self-liking (Tafarodi & Swann, 1995; Tafarodi & Milne, 2002; Sinclair, Blais, Gansler, Sandberg, Bistis, & LoCicero, 2010). Self-competence has been defined as the valuation of the self as a causal agent of success and failure thus sitting closely with the definition of James (1890/1983) above (Tafarodi & Milne, 2002). These same authors defined self-liking as the valuation of the self as a moral and aesthetic social object. Such self-liking would seem to knit tightly with cognitive-behavioural models of BDD (Veale, 2004; Veale & Neziroglu, 2010). Self-liking might therefore be disproportionately low in people with BDD relative to self-competence as compared to in healthy controls.

1.2.8 Rationale II

Aspects of A-RCs may contribute to distress maintenance in BDD. Cognitive-behavioural models also need to be as disorder specific as possible in order for effective treatment to follow. As an initial part of the present investigation it was therefore considered important to study the nature (frequency, direction, and automaticity) as well as the specificity of A-RCs in people with BDD. Research has shown that people belonging to clinical populations can have beliefs about the processes they engage in which leads to a maintenance of feared outcomes and associated distress (Salkovskis, 1991). For example, it is reported that people with BDD use S-FA as a safety-seeking behaviour i.e. as a means through which they can check their appearance to prepare for future social threat (Veale & Neziroglu, 2010). To the best of the author's knowledge however beliefs about A-RCs have not yet been the topic of empirical research. It is important that this gap in the literature is filled because A-RCs can be both time-consuming and a key distress maintenance factor for people with BDD (Veale, 2004).

A proposed lack of a self-serving appearance-related bias in BDD, possibly owing to persistent S-FA on a distorted or disturbed mental image strongly influenced the main hypothesis of the present research (Veale & Neziroglu, 2010; Neziroglu et al., 2008). There is currently only one study on self-serving biases in people with BDD (Lambrou, Veale, & Wilson, 2011). More specifically however there are no studies testing for a self-serving appearance-related *comparing* bias in people with BDD. Furthermore there are only a small number of studies that have investigated implicit processes in people with BDD (Buhlmann et al., 2008; Buhlmann et al., 2009; Buhlmann et al., 2011). Exploring implicit processes is important because such processing is asserted to maintain anxiety pathology (Beck & Clark, 1997; McNally, 1995). The above literature sets the scene for the present study's aims and hypotheses which are stated below.

1.2.9 Aims and hypotheses

The present research's first aim was to investigate the *process* of A-RCs in people with BDD and healthy controls. This aim was addressed with hypothesis 1 which explored the nature (frequency, direction (attractiveness of A-RCs targets) automaticity) of A-RCs and hypothesis 2 which explored the specificity of A-RCs in people with BDD relative to healthy controls. This aim was also addressed with exploratory work investigating the functions of A-RCs in people with BDD and healthy controls. The first aim was also addressed with hypothesis 3 which investigated a self-serving A-RCs bias proposed to exist in healthy controls but not people with BDD. The present research's second aim was to investigate a construct well known to be influenced by, and therefore considered as an *outcome* of, social comparing. This construct was self-esteem and this second aim was addressed with hypothesis 4 which investigated different components of self-esteem in people with BDD relative to healthy controls.

Hypothesis 1: Exploring the nature of A-RCs in BDD

This hypothesis explored the nature (frequency, direction, and automaticity) of A-RCs in people with BDD. There is indeed an emerging finding in the literature that people with BDD engage in A-RCs more often than healthy controls and so the author investigated this further for clinically useful information.

Research question 1: Does the nature of A-RCs differ in people with BDD relative to healthy controls?

Hypothesis 1: In people with BDD A-RCs would be more frequent, generally more upwards and more automatic.

Hypothesis 2: Exploring the specificity of A-RCs in BDD

The possibility that a higher frequency of A-RCs in people with BDD relative to healthy controls can be attributed to less disorder specific factors has not yet been studied. Analyses were therefore planned comparing people with BDD and healthy controls on the frequency of A-RCs while covarying for the more general factors of social comparison orientation and self-esteem.

Research question 2: Is the higher frequency of A-RCs in people with BDD relative to healthy controls attributable to more general constructs related to comparing?

Hypothesis 2: The more frequent A-RCs in people with BDD would not be attributed to more general constructs related to comparing.

Exploring beliefs about the functions of A-RCs

The author also explored the phenomenology of A-RCs by investigating why people with BDD relative to healthy controls engage in this process. A brief but clinically relevant measure of theory and evidence based subscales on the possible functions of A-RCs was therefore generated. No hypothesis was made for this part of the present investigation because it is a newly explored area of research with no literature addressing this aim in people with BDD to the best of the author's knowledge.

Research question: Do beliefs about the functions of A-RCs differ between people with BDD and healthy controls?

Hypothesis 3: Investigating the self-serving A-RCs bias

This hypothesis investigated the self-serving A-RCs bias found in previous research with the use of a novel experimental design. The third aim was therefore to

investigate the hypothesis that people with BDD do not hold the self-serving appearance-related comparing bias that is seen in healthy controls.

Research question 3: Do people with BDD show the same self-serving processing of appearance-related comparison information when self-focused, as that seen in healthy controls?

Hypothesis 3: Healthy controls but not people with BDD would show a self-serving processing of appearance-related comparison information contingent on self-focused attention.

Hypothesis 4: Exploratory analyses on self-esteem in BDD

Analyses were planned to explore our theoretical but also clinically relevant reasoning behind the differences which may, or may not, exist between self-competence and self-liking in BDD. That is, it is important to know what aspects of self-esteem are influenced by BDD to gauge what appearance-concerns mean to the self in BDD. Proposed divisions of self-esteem were therefore explored in BDD with supplementary analyses.

Research question 4: Were the divisions of self-esteem influenced to a differing extent in people with BDD relative to healthy controls?

Hypothesis 4: Self-liking would be disproportionately lower than self-competence in people with BDD relative to healthy controls.

2.0 Method

2.1 Participants

Participants comprised 23 people with BDD (10 females, 13 males) and 20 healthy controls (10 females, 10 males).

2.1.1 People with BDD

Two South London and Maudsley (SLAM) National Health Service (NHS) Foundation Trust sites were used to recruit people with BDD. Outpatients (n= 6) were recruited from the Centre for Anxiety Disorders and Trauma (CADAT) at the Maudsley Hospital. These patients were either those that had been recently recruited for a BDD treatment trial or had been newly assessed for clinical treatment. Inpatients (n= 1) and patients who had been previously assessed and treated (recruited via postal adverts; n= 1) were recruited from the Anxiety Disorders Residential Unit (ADRU) at The Bethlem Royal Hospital. Participants (n= 9) were recruited from a BDD support group meeting monthly at The Priory Hospital in North London and this was also the source of recruitment of another inpatient (n= 1). Advertisements on the websites BDD Help, BDD Central, BDD Foundation, and OCD Action also acted as sources of recruitment (n= 5). In BDD patients recruited from CADAT and ADRU diagnosis had been established using DSM-IV criteria (APA, 2000). Exclusion criteria for BDD patients included the absence of a face, hair, or head-related concern (visible from anterior view), a BDD-YBOCS below 24 on items 1- 12, or if BDD was reported as not their primary diagnosis/ most distressing current mental health concerns. Other exclusion criteria included any current co-morbidity with eating disorders, psychosis, substance abuse, or borderline personality disorder (BPD).

There was an aim to recruit people with BDD who were reasonably naive to CBT for BDD to minimise treatment related changes to symptoms and clinical features, and appearance-related comparing in particular. N= 2 (4.7%) people with BDD were currently having CBT for BDD and had had some previous experience of this treatment in addition to their current course. N= 3 (7%) people with BDD were currently having CBT for BDD for the first time. Of those currently having CBT for BDD, 3 (2 outpatients; 1 inpatient) had only just started this treatment whereas 2 had had a substantial number of sessions (1 outpatient; 1 inpatient). N= 11 (25.6%) people with BDD had never had CBT for BDD. In total n= 23 people with BDD were recruited and these participants all completed testing. The distractor task used in the experimental procedure however was reported to elicit notable reflections by one person with BDD. This participant's experimental data was therefore omitted

from the dataset. Experimental data was therefore available for n= 22 people with BDD.

N= 19 (82.6%) people with BDD reported that their face, head hair, or head-related concern was also the area/feature of their body that they found the most disturbing. N= 4 (17.4%) had their face, head hair, or head-related concern as secondary to some other reported area/feature of concern. These areas/features of concerns were the skin (n= 2), the skin on the back of the neck (n= 1), and the knees (n= 1). People with BDD reported the mean age of onset to be 15.30 yrs (S.D. = 4.92). N= 9 (39.1%) people with BDD reported being on current medication, n= 6 (26.1%) reported having been on medication in the past and n= 8 (34.8%) reported never having been on medication for mental health.

2.1.2 Healthy controls

Healthy controls (n= 5) were recruited from “Mindsearch” (a database associated with the IOP), a circular email to King’s College London staff (n= 11) (see appendix 2) and some convenience sampling (n= 4) to gather a representative sample of the general population. Furthermore, such sampling was used to prevent the caveats of having an overly homogenous control group (e.g. undergraduates; see Wintre, North & Sugar, 2001). A rigorous screening process was used with healthy controls to exclude all axis 1 current mental health problems including BDD, eating disorders, substance abuse as well as BPD. A history of significant mental health problems was also screened for including psychosis, major depression, excessive body image concerns/ BDD, eating disorders, substance abuse, as well as BPD (by virtue of current diagnosis). Exclusion criteria for healthy controls also included those working as academics, researchers or clinical staff or studying in the fields of science, medicine, or psychology. In total n= 20 healthy controls were recruited and they all completed testing.

Inclusion criteria for all participants was being at least 18 years of age and being able to understand the materials and instructions used in the study. The healthy controls were matched to the group of people with BDD, approximately, according to both age and sex to prevent a confound effect from these demographics (see section 3.2

for statistics). Indeed body image has been found to be perceived quite differently according to both age and sex and these characteristics are spontaneously encoded from faces with high levels of accuracy (Rusticus & Hubley, 2006; Santos & Young, 2005; Bruce et al., 1993). Furthermore dimensions of appearance comparison have been shown to have considerable differences amongst the sexes (Fisher, Dunn, & Thompson, 2002).

2.2 Vision

All participants had normal or corrected to normal eyesight with the exception of two people with BDD who reported that they were avoiding their possible need for glasses due to their BDD concerns. Difficulties seeing the testing material were not reported however.

2.3 Design

The experimental design was adapted mainly from study one in Schwinghammer et al. (2006) who used a between-subjects design. The present investigation used a cross-sectional cross-over design. There were four conditions using a 2 (participant group as a between subject factor: BDD, healthy control) \times 2 (attention as a within subject factor: S-FA, control attention condition (CAC)) mixed design. The use of attention as a within-subject factor allowed better statistical power given the recruitment of a difficult to recruit clinical population in a time-limited period.

2.4 Piloting

2.4.1 Pre-piloting

The procedure below was run through with a colleague from the IOP who had a PhD and who was also a Trainee Clinical Psychologist. There were no changes to the procedure.

2.4.2 Main piloting

The procedure was briefly piloted with 2 people with BDD to find out if the procedure was easy to engage with in terms of its duration and complexity. The pilot participants were asked for their thoughts on the procedure. They were then asked if it made sense given the topic of study. Nothing was changed and so the data from these participants was included in all analyses. See figure 1 for a representation of the procedure in which DVs stands for dependent variables.

Figure 1.

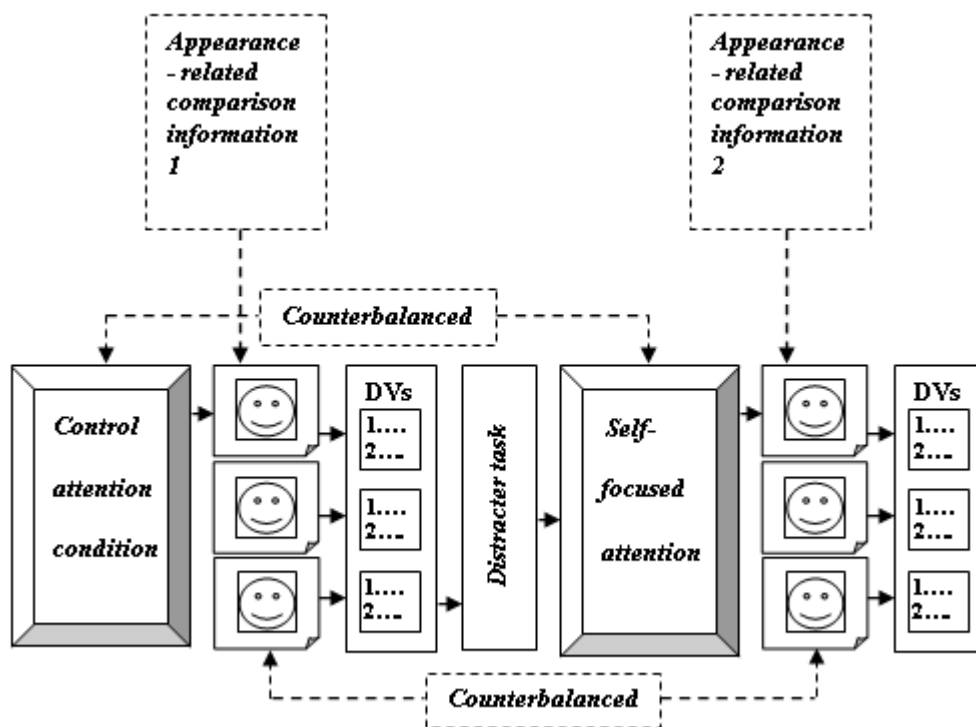


Figure 1. A diagrammatic representation of the experimental procedure.

2.5 Procedure

A flow chart of recruitment, screening, and testing is provided (see appendix 3). After reading about the study and consenting to participation participants completed an initial battery of measures for screening purposes. They then completed the

experimental procedure. Following the experimental procedure a second battery of measures was completed. More detail on each stage of the procedure follows.

2.6 Participant information and consent

Information and consent forms written separately for each group were distributed to people who had shown an interest in participating (see appendix 4). These were read and signed before participation commenced. These forms did not include information regarding the topic of experimental manipulation (S-FA) or the physical attractiveness of the faces in the photographic portraits used.

2.7 Measures

The measures used are summarised below with a description of their content and reasons for their use. A summary of psychometric properties found in research as well as in the present sample (where possible and theoretically sensible) can also be found in appendix 5.

2.7.1 Psychiatric Disorders Screening Questionnaire (PDSQ)

Description: The PDSQ (Zimmerman & Mattia, 2001a; Zimmerman & Mattia 2001b) is a self-administered questionnaire with 125 items which allows screening of thirteen DSM-IV axis 1 psychiatric disorders, from five areas most frequently found in outpatient mental health settings: (1). Eating disorders (bulimia/binge-eating disorder); 2. Mood disorders (major depressive disorder); 3. Anxiety disorders (panic disorder, agoraphobia, post-traumatic stress disorder, obsessive-compulsive disorder, generalized anxiety disorder, and social phobia); 4. Substance use disorders (alcohol abuse/dependence and drug abuse/dependence); and 5. Somatoform disorders (somatization disorder and hypochondriasis). There is also a 6-item psychosis screen. Items inquire about current and recent symptoms using time-frames that correspond to DSM-IV symptom-duration requirements for each disorder. Cut-off scores and follow-up guides are provided for these disorders.

Reason for use: Rush et al. (2005) reported that, despite being a screening questionnaire, the PDSQ uses a threshold with a 90% specificity for the presence of each disorder. These authors therefore documented the PDSQ as providing a reasonable estimate of the overall prevalence of frequently found comorbid conditions when studying depressed outpatients. The PDSQ was therefore deemed to be a reasonably accurate method of ascertaining if BDD was the primary disorder in the clinical group. It was also used to screen healthy controls for axis 1 disorders in keeping with exclusion criteria.

2.7.2 Body Dysmorphic Disorder Questionnaire (BDDQ)

Description: The BDDQ is a brief self-report screening questionnaire for BDD (Phillips, 1996b). The BDDQ asks participants for a yes/no response to the question “are you worried about how you look?” If the answer to this question is yes then a second yes/no response question is asked. This second question asks about preoccupation with the reported appearance concerns, including whether the participant wishes that they could think about them less. Those participants indicating a preoccupation with their appearance are then asked to report their body area(s) of concern. Participants who answered yes to the above two questions are then asked for a yes/no response to a question asking if their main appearance concern is related to being too thin or too fat. A four part question then asks for yes/no responses to how the problem has affected the participant’s life in terms of distress, impairment in social and occupational functioning and avoidance. The final question asks the participant about the amount of time that is spent thinking about how they look (<1 hour a day, 1-3 hours a day, >3 hours a day). To screen positive for BDD a participant must fulfil all of the disorder’s DSM-IV criteria by reporting a preoccupation with a perceived appearance flaw that is thought about for more than one hour a day. They must also be experiencing significant distress or impairment in functioning as a result.

Reason for use: The BDDQ was used to ensure that the healthy controls did not have BDD. Such exclusion was highly important given that proposed differences between people with BDD and healthy controls were central to the research.

2.7.3 Structured clinical interview for DSM-IV axis II personality disorders (SCID II; version 2.0) (Borderline Personality Disorder (BPD) section only)

Description: The SCID-II 2.0 was designed by First, Spitzer, Gibbon, Williams, & Benjamin (1994). It is a semi-structured diagnostic interview which can be used for the assessment of a comprehensive list of DSM-IV (APA, 1994) axis II personality disorders with its various sections. In the present research the BPD brief self-report screening questionnaire (14 statements requiring yes/no responses) as well as the SCID-II 2.0 BPD section (completed where participants screened positive; i.e. $5 \geq$ yes responses) was used. The BPD section provides the interviewer with the DSM-IV criteria as well as with questions that are efficient in eliciting the information necessary in judging each criterion's presence or absence.

Reason for use: This clinical interview was used to screen all participants for BPD as per our exclusion criteria because the results of Marfei et al. (1997) suggested that it can be suitably used in studies of a cross-sectional design involving both inpatients and outpatients. It was unlikely that our healthy controls would meet such a diagnosis due to our request for volunteers with no known psychiatric history. However, the assessment was carried out for rigour. The clinical interview was important in ascertaining that the concerns of people with BDD were not part of or confounded by the broader picture of complexities, such as a disturbed self-identity, found in BPD. Indeed, one study found BDD to be extremely common in participants with BPD as their main problem (Semiz, et al., 2008). SCID-II structured interview schedules have been used to diagnose BPD in people with BDD by others Neziroglu, McKay, Todaro, & Yaryura-Tobias (1996).

2.7.4 General Details Forms

Description: The general details forms for both people with BDD and healthy controls included questions to collect preferred contact details and information regarding demographic variables. A question to assist with the exclusion of participants with a current episode of Anorexia Nervosa (AN) was also included. The form for healthy controls also included questions to assist with the exclusion of participants with previous episodes of psychosis, MDD, bulimia/binge-eating

disorder, AN, BDD symptoms, and drug or alcohol abuse. The wording of these questions was based on those used in the PDSQ. See appendix 6.

Reason for use: Information to describe our groups' demographic variables was deemed useful in understanding more general differences between people with BDD and healthy controls. Such potential group differences might have informed our experimental findings and may have been needed for co-variate purposes. In addition, because the PDSQ does not cover Anorexia Nervosa it was also useful to use this form to assist with the exclusion of people with current restricted eating.

2.7.5 Yale-Brown Obsessive Compulsive Scale for Body Dysmorphic Disorder (BDD-YBOCS)

Description: The BDD-YBOCS is a 12-item semi-structured, clinician-administered measure which is based on the Yale-Brown Obsessive Compulsive Scale (Phillips, Hollander, Rasmussen, Aronowitz, DeCaria, Goodman, 1997; Y-BOCS; Goodman et al., 1989a; Goodman et al., 1989b). It assesses the severity of BDD symptoms over the past week covering preoccupations (items 1-5), compulsive behaviours (items 6-10), insight (item 11), and avoidance behaviours (item 12). Each item uses a scale from 0-4. Higher scores are indicative of a greater extent of BDD symptomatology. Scores range from 0-48.

Reason for use: This measure was included to assess the severity of BDD keeping in mind that exclusion criteria included less than a moderate level of symptoms (<24 on items 1-12; Phillips et al., 1997).

2.7.6 Hospital Anxiety and Depression Scale (HADS)

Description: The HADS (Zigmond and Snaith, 1983) is a widely used 14-item self-report measure assessing the severity of current symptoms of anxiety and depression over the past week. Each item uses a 4 point scale. Higher scores are indicative of a greater extent of anxiety and depression. The internal consistencies for anxiety and depression in the current sample were Cronbach's $\alpha = .92$ and $.87$, respectively.

Reason for use: This scale was used to measure the extent of clinical anxiety and depression symptoms in group comparisons between people with BDD and healthy controls

2.7.7 Multidimensional Body-Self Relations Questionnaire – Appearance Scales (MBSRQ-AS)

Description: The MBSRQ-AS (Cash, 2000) is a 34 item standardised self-report questionnaire measuring the cognitive, affective, and behavioural components of an individual's body image. The MBSRQ-AS has 5 subscales. The Appearance Evaluation (AE) subscale (7 items) assesses positive and negative appraisals of an individual's own body image with higher scores indicative of more positive body image evaluations. The Appearance Orientation (AO) subscale assesses investment in and importance of appearance, with higher scores indicating greater orientation. The Body Areas Satisfaction Scale (BASS) assesses degree of satisfaction with specific body areas and attributes, with lower scores indicating greater body dissatisfaction. The Overweight Preoccupation (OP) subscale (4 items) assesses fat anxiety, weight vigilance, dieting, and eating restraint, with higher scores indicating greater preoccupation. The Self-Classified Weight (SCW) subscale assesses perceptions of weight (under-over weight), with higher scores indicating a body image of being more overweight. Participants respond to item statements using a 5 point scale from 1= definitely disagree/ very dissatisfied to 5= definitely agree/ very satisfied depending on the item.

Reason for use: These subscales were used to assess body image attitudes in both people with BDD and the healthy controls. The MBSRQ-AS has commonly been used to assess body image in the psychological literature. There is research using the MBSRQ-AS in people with BDD and in healthy controls assessing differences in body image (Hrabosky et al., 2009; O'Brien et al., 2009). The MBSRQ-AS has also been used in research on A-RCs amongst groups of people differing in their degrees of body satisfaction (Leahey, Crowther, & Mickelson, 2007).

2.7.8 Body Comparison Scale (BCS)

Description: The BCS (Fisher and Thompson, 1998) is a 36-item self-report questionnaire assessing the frequency of A-RCs to same-sex individuals. The first 25 items require responses for comparisons of specific body sites to the same body sites of same-sex individuals. The last 10 items require responses regarding general tendencies to engage in some specified A-RCs. The total score ranges from 36-180.

Reason for use: The BCS was used to look at differences in the frequencies of A-RCs between people with BDD and healthy controls. The BCS was also deemed the most adequate dependent variable for such group comparisons while including certain co-variables in analyses due to its established psychometrics and wide usage. The BCS was therefore used to explore hypothesis 1 and 2. It was also used to measure the concurrent validity of some items of the PA-RCS.

2.7.9 Physical Appearance-Related Comparisons Scale (PA-RCS)

Description: The PA-RCS is a brief version of the Physical Appearance Comparison and Evaluation Scale (PACES) questionnaire designed in the first supervisor's PhD (Anson, 2008). The PA-RCS has 9 items which are divided across 4 sections. Each section starts with the same introductory passage as follows: "In situations when you see others of the same sex, i.e. when you are: out in public, in social situations/interacting with people, or when you are reading/looking at magazines, watching television/films, looking on the internet etc." Section one includes two questions asking about the frequency of A-RCs to same sex others in terms of overall physical appearance (question (qu.) 1) and the specific facial or body features of most concern (question 2).

Section two includes three questions asking about the frequency of A-RCs to same sex others of differing physical attractiveness (attractive, (qu. 3) average (qu. 4), and unattractive (qu. 5) others) to cover both upwards and downwards comparisons (O'Brien et al., 2009). Section three includes a question asking how participants generally rate/judge the physical attractiveness of same sex others in comparison to their own physical attractiveness (qu. 6). The second question in section three then

asks how satisfied participants generally are with their own physical appearance after comparing to the physical appearance of others of the same sex (qu. 7).

Section four included two questions asking about the frequency of automatic comparing (i.e. without at first realising (qu. 8) and without a clear aim (qu. 9) to same sex others (Want, 2009). All nine items use scales ranging from 0% (none of the time/ much less attractive than me/ much less satisfied) to 100% (all of the time/ much more attractive than me/ much more satisfied) to gauge participant responses. This questionnaire is shown in appendix 7.

Reason for use: The PA-RCS was used to collect data on the nature of A-RCs (frequency, direction, and automaticity) in the sample for group comparisons between people with BDD and healthy controls and to provide a more meaningful context to the data on the functions of A-RCs. The PA-RCS was therefore predominantly used to explore hypothesis 1.

2.7.10 Iowa-Netherlands Comparison Orientation Measure (INCOM)

Description: The INCOM (Gibbons & Buunk, 1999) is an 11-item measure of individual differences in social comparison orientation capturing core aspects of the self, the other, and the psychological interaction between the two. Two items are reverse coded, functioning as a control for acquiescence biases (Oskamp and Schultz 2004). The items use statements about comparisons between the self and others on a variety of topics that include both opinions and abilities (Festinger, 1954). The INCOM also includes two separate 6-item subscales looking at individual differences in the tendency to make upwards and downwards comparisons (The UCS and DCS, respectively). Participants answer all items using a five point likert scale ranging from A, strongly disagree (1 point), to E, strongly agree (5 points). Scores therefore range from 11-55 on the INCOM and 6-30 on the UCS and DCS with higher scores indicating greater social comparison orientations.

Reason for use: The INCOM was used to highlight if the extent of A-RCs in people with BDD relative to healthy controls could be attributed to a more general tendency towards making social comparisons (i.e. from outside the domain of appearance).

This data was deemed particularly important in the absence of a clinical control group because there might be variation in a psychological predisposition towards making social comparisons (Buunk & Mussweiler, 2001). The INCOM was therefore used to co-vary for social comparison orientation in group comparisons of A-RCs in an exploration of hypothesis 2.

2.7.11 Rosenberg Self-Esteem Scale (RSES)

Description: The RSES is a well known and widely used 10-item measure of global self-esteem with each item using a 4-point (0-3) likert scale ranging from *strongly agree* to *strongly disagree* (Rosenberg, 1965). The RSES items were designed for fast and easy administration and scoring of a unidimensional construct (Blascovich & Tomaka, 1991, p. 121). Total scores can range from 0 to 30 with higher scores indicating higher self-esteem. Tafarodi and Milne (2002) also showed that there is validity in dividing the scale into measures of self-competence and self-liking. Indeed this division was shown to follow the item selection used to create factors of assessment and acceptance, respectively (Tafarodi & Milne, 2002). The self-competence and self-liking subscales therefore have 5 items each with each of these subscales having total scores ranging from 0-15.

Reason for use: The RSES was used to explore the difference in self-esteem between people with BDD and the healthy controls. In a previous study the RSES score was lower by approximately 1.5 standard deviations in people with BDD compared to nonclinical samples (Phillips et al., 2004). The RSES was also used to allow an exploration of self-competence and self-liking in people with BDD relative to healthy controls. Sinclair et al. (2010) made the same division using the RSES in a large cohort of adults. The RSES was therefore predominantly used to explore hypothesis 4.

2.7.12 Beliefs about Appearance-Related Comparisons Subscales (BA-RCS)

Description: The BA-RCS was developed in order to cover the beliefs about the functions of A-RCs that drive their use in people with BDD and healthy controls. The measure was developed from psychological literature on comparing, as well as

by adapting items from the Mirror Questionnaire and from clinical experiences of people with BDD (Veale & Riley, 2001). The scale has 20 items that use scales from 0% (no agreement) to 100% (complete agreement). These items are organised into 5 subscales: comparing to check/verify for self-evaluation; comparing to put something right through self-enhancement; comparing to put something right through self-improvement; comparing as self-loathing; and comparing as threat management. Each subscale has 4 items and is scored using a mean of the four item total (i.e. with a maximum of 100). Higher scores indicate a greater extent of agreement with the corresponding belief about the function of A-RCs. A more in depth explanation of how this measure was developed can be found following the description of its reason for use below. See appendix 8.

Reason for use: The BA-RCS was developed and used because there is no research, to the author's knowledge, looking at the beliefs that people with BDD have about why they engage with A-RCs. The BA-RCS was therefore not used in any exploration of a hypothesis although addressed one of the authors research questions.

2.7.13 Development of the BA-RCS

Classifying A-RCs as a compulsive behaviour

Briefly reviewed earlier was the emerging view of many researchers that BDD is an obsessive-compulsive spectrum disorder in that the cognitions and behaviours have a strong resemblance to those found in OCD. Like the other compulsive behaviours found in people with BDD (such as mirror-gazing) A-RCs become time-consuming and difficult to resist despite the distress they induce. Furthermore, people with BDD have been found to hold a whole range of appearance-related beliefs about behaviours such as mirror-gazing with stronger conviction than healthy controls (Veale & Riley, 2001). In the same study, Veale & Riley (2001) showed that people with BDD were significantly more likely than healthy controls to endorse mirror-gazing as something that distorted their judgement about how attractive they were. It was therefore further reasoned that there might be additional functions of A-RCs that were more specific to the psychopathology of BDD which drive continue to drive this behaviour irrespective of the distress it seemingly induces. In keeping with the

consideration of A-RCs as a compulsive behaviour Veale proposed that they can be deemed as a process designed to either: 1.) *Check / verify something about appearance* 2.) *Put something right about appearance*.

Drawing from comparison motives in social comparison research

Given that A-RCs were assumed to have one of these two above mentioned *a priori* aims, it was suggested by an expert in the field of BDD (D.V.) that the items generated should describe the desired end-goal of comparing before comparing occurs. Moreover beliefs about the functions that A-RCs might serve were deemed to be synonymous with the comparer's motives for comparing in the first place. It therefore seemed logical to look towards the wider social comparison literature for comparison motives. In their work in developing a measure of social comparison orientation Gibbon & Buunk (1999) neatly reviewed comparison motives as falling into three specific categories of: a.) *Self-evaluation* b.) *Self-improvement* c.) *Self-enhancement*.

Self-evaluation

As reviewed earlier Festinger's theory of social comparison processes (1954) stated that comparing occurs with similar others in order to gather subjectively accurate self-evaluations. This motive for social comparing therefore resides in attempting to find out where one stands in relation to another indeed through a process of social checking or verification.

Subscale 1: *The BA-RCS subscale 1 thus highlighted A-RCs as a process with a primarily cognitive function: Comparing to check/verify for self-evaluation. For example: "I compare to find out how attractive/unattractive I really am".*

Self-improvement

Festinger (1954) also stated that in the process of social comparing, a drive upward exists whereby individuals orientate comparisons of themselves to those who are thought to be similar yet superior. Despite not explicitly stated in his theory, this is

consistent with a method of learning to try and improve the self or one's abilities. The use of upwards social comparisons in attempts at self-improvement has gained some evidence (Collins, 1996). In addition, at least in healthy female participants, it has been shown that A-RCs focused on self-evaluation were associated with increased body-focused anxiety relative to a no A-RCs control condition (Halliwell & Dittmar, 2005). Importantly however these authors also showed that such increases in anxiety were not seen relative to the no A-RCs control condition when A-RCs were focused on self-improvement. It was therefore reasoned that self-improvement was an important function of A-RCs to cover in the BA-RCS following the understanding that A-RCs induce high levels of distress in people with BDD.

Furthermore however, self-improvement also seemed relevant for the *BA-RCS* because it was not known if people with BDD were using A-RCs to work out what they might change about their appearance given their frequent and sometimes extreme efforts to do so. Moreover it was reasoned that A-RCs might be one method through which people with BDD gather information about what to target for medical or home treatment/ "do it yourself" surgery (Phillips et al., 1993; Sarwer, & Crerand, 2008; Veale, 2000). Interestingly people with BDD have reported standing in front of mirrors "pulling my features or squashing my nose to see how I'd look if I had plastic surgery" (Veale & Riley, 2001). This report is in keeping with the above reasoning for a possible use of A-RCs in people with BDD. Such a use would make sense given that Festinger (1954) stated that the drive towards reducing discrepancies in self-evaluations found in social comparing is increased if the ability or opinion is perceived with importance. It is noteworthy that some of the items on this subscale might also have touched upon the use of safety seeking behaviours in people with BDD although this was focused on more so in a later subscale.

Subscale 2: *Subscale 2 of the BA-RCS thus highlighted A-RCs as a process with a cognitive-behavioural function: Comparing to put something right through self-improvement. For example: "I compare in order to help me work out how I can improve my appearance".*

Self-enhancement

Brickman & Bulman (1977) asserted that comparisons with others who are thought to be superior in some way might be informative yet also threatening. These authors therefore proposed that such upwards A-RCs might be avoided in some people perhaps in favour of downwards comparing. Indeed Wills (1981) later argued that people sometimes compare themselves to those who are worse off when in situations characterised by threat that produce a decrease in well-being. Such downwards comparisons have been asserted as a means of helping oneself cope and therefore feel better. Downwards A-RCs have been reported in the domain of appearance (O'Brien et al., 2009). Self-enhancing downwards comparisons have however also been found in non-threatening situations to enhance feelings of satisfaction (Buunk & van Yperen, 1989; Buunk, Oldersma, & de Dreu, 2001). More specific to body comparisons some literature now supports the use of A-RCs in strategies that are likely to be self-enhancing (Franzoi, et al., 2012).

***Subscale 3:** Subscale 3 of the BA-RCS thus highlighted A-RCs as a process with a cognitive-affective function: Comparing to put something right through self-enhancement. For example: “I compare to try and reduce the negative feelings I have about my looks”.*

Confirming beliefs about physical unattractiveness

Cash (1991, 2008) described a cognitive bias for A-RCs with people who are deemed more attractive and he coined this “unfair to compare”. Recent research has confirmed that this cognitive bias is found in people with BDD who also make more A-RCs than healthy controls more generally (Anson, 2008). Interestingly however recent evidence also suggests that people with BDD have a selective attentional bias for looking at the facial area that they perceive to be defective in themselves during observations of unfamiliar faces (Grochowski, Kliem, & Heinrichs, 2012). The above research suggested an additional self-defeating aspect to A-RCs in people with BDD which might fit closely with the aspects of inductive reasoning found more so in people with OCD relative to healthy controls (Simpson, Cove, Fineberg, Msetfi, & Ball, 2007). These aspects included a need for more information which might be

reflected in the higher frequency of A-RCs in people with BDD (Anson, 2008) and less attempts to prove their own beliefs about physical appearance wrong, which might be reflected in the selective attention to disliked features in others (Grocholewski et al., 2012). Similarly, beliefs about A-RCs in people with BDD might reflect a data-gathering reasoning bias as found in people who are prone to delusion formation and maintenance (Colbert, & Peters, 2002). People with BDD indeed frequently hold inflexible and overvalued beliefs about self-evaluated physical attractiveness which are often of a delusional intensity (Veale, 2002; Phillips et al., 2006).

It was therefore proposed that people with BDD might report using A-RCs as a means of proving their own beliefs about their flawed appearance correct. A subscale reflecting beliefs about A-RCs as part of a confirmation bias about physical unattractiveness in people with BDD was therefore created. In keeping with this possibility people with BDD have reported standing in front of mirrors to “pull ugly faces to prove how disgusting I am” (Veale & Riley, 2001). Confirmation biases have been reported in other areas of psychopathology and in non-clinical samples prone to delusion formation (Woodward, Moritz, Cuttler, & Whitman, 2006; Woodward, Buchy, Moritz, & Liotti, 2007).

Subscale 4: *Subscale 4 of the BA-RCS thus highlighted A-RCs as a process with a primarily cognitive function: Comparing as self-loathing. For example: “I compare in order to help me prove to myself that I am really ugly”.*

Safety seeking and avoidance

A final subscale was produced to tap into the possibility that people with BDD might use A-RCs to manage the associated threats, such as social-evaluative concerns, that often come with this disorder (Pinto & Phillips, 2005; Coles et al., 2006). Such potential methods of management were thought to include safety seeking behaviours, checking, and avoidance as seen in the other anxiety disorders (e.g. Salkovskis, 1999; Clark, & Wells, 1995). Veale & Riley (2001) found that people with BDD were driven to mirror-gaze by a desire to camouflage themselves for example. In

keeping with this it was reasoned that A-RCs might be one way that people with BDD inform and regulate their camouflaging, checking and avoidance behaviours.

***Subscale 5:** Subscale 5 of the BA-RCS thus highlighted A-RCs as a process with a cognitive-behavioural function: Comparing as threat management. For example: “I compare in order to know if I should go and check my appearance”.*

2.7.14 Finalised presentation of the BA-RCS

After subscale items had been viewed and confirmed by both M.A. and D.V. they were put into questionnaire format. Items were not presented clustered into subscales to minimise the chance of a response bias/ order effect of presentation. Each item used a scale from 0% (no agreement) to 100% (complete agreement). This scale was used to maximise the chance of picking up response variance especially since ceiling effects have been found in self-reports of BDD phenomenology.

2.8 Testing procedure

2.8.1 Testing environment

N = 39 (90.7%) participants were seen in the same room for testing with the chief investigator seated opposite them for administration of questionnaires and seated behind a screen during the experimental procedure. Both BDD inpatients and two of the BDD outpatient participants (n = 4, 9.3%) who preferred to participate at the Priory Hospital in North London however had different testing environments. Statistical power was a priority over higher control of the testing environment.

2.8.2 Administration of battery 1 measures

The following measures were administered in person before the experimental procedure: BDD History (people with BDD only), General Details Form, PDSQ, SCID-II (Borderline Personality Disorder (BPD) section only) and, the BDD-YBOCS (people with BDD only).

2.8.3 Description of experimental procedure

All participants viewed a booklet which said “this booklet has simple instructions to take you through some short tasks. When you arrive at the section with faces please form an impression of these people as some questions about them will follow”. There was then an instruction page illustrating how to respond to the scales used to index the dependent variables. One of the following attention conditions then followed:

S-FA: S-FA was induced with the completion of a vignette task used in Stapel & Koomen (2001) and Schwinghammer et al. (2006) (modelled after Brewer & Gardner, 1996). Findings from Schwinghammer et al. (2006) also provide construct validation/ research reliability for the use of this manipulation- see their table 1 in their discussion). Participants were asked to read a vignette (describing a trip to the city; see appendix 9) carefully and circle all the pronouns within it which may be singular (e.g. *I, me, my, myself, or mine*).

CAC: The control attention condition involved written instructions asking the participants to describe three qualities of a chair (as per Schwinghammer et al., 2006). These conditions were counterbalanced to minimise order effects.

Photographic portraits: In total 12 photos (6 males and 6 females) were used. These were organised into two sets of 3 for each sex. These photos were taken from a database of 1000 photographs of faces that had been used in psychological research prior to the present investigation (Santos & Young, 2005). These authors had mean ratings for the photos gathered from a representative cohort who had used likert scales ranging from 1-7 to rate several characteristics of which physical attractiveness was one.

The photos were selected for their level of high physical attractiveness (>5 out of 7). This selection was justified by an attempt to replicate findings from the healthy student sample used in Schwinghammer et al. (2006). These researchers showed that upwards A-RCs information (an attractive portrait), in the context of implicit S-FA, was processed in a self-serving manner (for both the participants’ self-evaluated level of attractiveness and that of the person viewed in a portrait) relative to their control

attention condition with a large effect. The use of an unattractive portrait however led to a smaller effect. In addition to the use of a repeated-measures variable the choice of stimuli therefore made the design more sensitive to adequately test the main hypothesis in people with BDD- a challenging to recruit clinical population. Furthermore people with BDD have been found to perceive physically attractive (but not average or unattractive) faces as significantly more attractive as compared to those without BDD (Buhlmann, Etcoff, & Wilhelm, 2008). The choice of stimuli therefore also maximised sensitivity to group differences in perceived attractiveness. The photos were grouped into sets A and B for each sex and were matched for mean level of physical attractiveness (see appendix 10). Indeed the author wanted to keep this variable controlled especially given that there is partial evidence to show that physical attractiveness is spontaneously processed in faces (Santos & Young, 2005). The photo sets were the A-RCs information.

A-RCs information: Following each attention condition, participants were exposed to A-RCs information made up of the sets of 3 photographic portraits described above. There were sets of portraits for each sex. Each participant viewed sets matched to their sex because both healthy controls and people with BDD tend to target their own sex for A-RCs (Anson, 2008). Furthermore, sex is also spontaneously encoded from faces with high levels of accuracy (Santos & Young, 2005; Bruce et al., 1993). A different set of portraits followed each attention condition. The photo sets (set A, set B) were counterbalanced between the attention conditions for experimental rigour.

Immediately following each photographic portrait participants were exposed to written instructions asking for ratings which were used to index the dependent variables (as per section 2.8.5). Participants therefore completed these ratings three times for the CAC and three times for the S-FA condition.

Distracter task: Half way through the experimental procedure, following the attention condition participants had been exposed to first, all participants were asked to play a non-verbal computer game. The game involved colour and concurrently played background music and was called Tetris[®]. During the game participants concentrated on creating lines using the moving shapes that they controlled on the

screen. The resulting number of lines did not differ statistically between people with BDD and healthy controls, giving an indication of approximately equal levels of task engagement ($U = 189.00$, $p = .44$, exact, 2-sided; $r = -.12$). The task was used to reduce tedium with the main task and to minimise the possibility of contaminating the experimental manipulation of attention.

Counterbalancing: The sets of photographic portraits and attention conditions were counterbalanced separately for both male and female people with BDD and male and female healthy controls. This was deemed necessary given that there is research suggesting that BDD symptoms may vary somewhat according to sex (Phillips & Diaz, 1997; Perugi et al. 1997; Phillips et al. 2003). Furthermore, there is evidence to show that appearance comparing is a process engaged in more often in people with BDD than in healthy controls and also more often in females than in males (Anson, 2008). Counterbalancing was therefore as rigorous as possible in order to diffuse any potential confounding group influence. See appendix 11.

2.8.4 Manipulation check

The experimental manipulation aimed to contrast the presence of S-FA with its absence/ more outward attention. Schwinghammer et al. (2006) did not use a manipulation check. These authors asserted that a manipulation check would interrupt the processes being studied which were claimed to be both volatile and implicit. They therefore referred to evidence that had illustrated the effectiveness of the experimental task instead. In the present study the same manipulation of S-FA was used albeit with a new participant population in a novel experimental design. Manipulation checks were therefore included following the last presentation of the questions used to measure the dependent variables for each attention condition. These checks were conducted using open ended questions. Following the S-FA the question asked “what were you doing and thinking about while reading the short vignette?” Following the CAC the question asked “what were you doing and thinking about while describing three qualities of a chair?” These questions allowed us to look for evidence of engagement with the attention tasks as well as any potential differential influence between people with BDD and healthy controls.

2.8.5 Dependent variables

Participants were exposed to written instructions asking for two ratings following the presentation of each photographic portrait. The first rating was as follows: “rate the physical attractiveness of the person you have just seen”. A scale ranging from 0 (“very unattractive”) to 100 (“very attractive”) was used to do this. Mean scores of the ratings given to the photos in each attention condition were taken to index this first dependent variable called *the general attractiveness of others*.

The second rating was as follows: “rate the physical attractiveness of the person you have just seen in comparison to your own physical attractiveness”. A scale ranging from -50 (“much less attractive than me”) to +50 (much more attractive than me”) was used to do this. Mean scores of the ratings given to the photos in each attention condition were also taken to index this second dependent variable called *self-evaluated attractiveness compared to others*.

These scales were used because research experience shows that floor and ceiling effects are often seen on smaller range scales when enquiring about physical attractiveness in people with BDD (M.A. *personal communication*). In addition to the DVs based on the mean ratings from the photos in each attention condition analyses were planned to look at if the effects of the manipulation were present (or possibly stronger) for the ratings given to the first photographic portraits directly following the attention conditions. This was planned because the manipulation of S-FA might have only induced a very transient effect and indeed this method of DV measurement more closely followed the procedure of Schwinghammer et al. (2006).

2.8.6 Administration of battery 2 measures

A second battery of measures was then administered, again in person, following the experimental procedure including the: HADS, MBSRQ-AS, BCS, PA-RCS, BA-RCS, INCOM, and the RSES. These are all described hereafter. All participants were compensated for their participation in the study with £10-20, irrespective of if they were later excluded.

2.9 Main analysis strategy

2.9.1 Descriptives

Statistical methods were used to describe the sample on the above measures and experimental data including simple frequencies, percentages, means and standard deviations (and medians where median statistical tests were employed) for participants with BDD and healthy controls. Some inferential statistics were also used to test for statistically significant differences in demographic details between the people with BDD and healthy controls.

The analysis for the main experimental design is now focused on because it was for this that statistical power was estimated. The power calculation is therefore covered subsequently.

2.9.2 Experiment

It was hypothesised (hypothesis 3) that healthy controls but not people with BDD would show a self-serving processing of appearance-related comparison information contingent on self-focused attention. This experimental hypothesis was addressed using two-way (2 (participant group: BDD, healthy control) \times 2 (attention condition: S-FA, CAC)) mixed-analyses of variance (ANOVA) for each dependent variable.

Despite it not being the main hypotheses, main effects of participant group were expected for both dependent variables, as close replications of Buhlmann et al. (2008). The main hypothesis however was addressed with the tests of interaction effects from the mixed ANOVAs.

The main hypothesis was explored by investigating whether there were significant interactions between participant group and attention condition for both the *attractiveness of the evaluated others* and *self-evaluated attractiveness compared to others*. Importantly the effects would need to be driven by these dependent variables, showing statistically significant self-serving ratings in the S-FA condition compared to the CAC in healthy controls but not in people with BDD. Planned pairwise

comparisons would then follow as post-hoc assessments of any differences between attention conditions for each participant group. Estimates of effect size using partial eta (η_p^2) or r were made throughout. All analyses were conducted using SPSS for WindowsTM (version 17.0).

2.9.3 Power analysis

As stated above our main experimental hypothesis was tested by the interaction effects between participant group and attention condition for each dependent variable. The dependent variables and design of the present investigation were not identical to those used in Schwinghammer et al. (2006). Data from this study however was deemed the most appropriate for the basis of a power analysis.

For the first dependent variable, *the general attractiveness of others*, it was assumed that the change between attention conditions in healthy controls would be approximately 1.17. This figure was taken from the difference in dependent variable means between the neutral self-activation and no self-activation conditions in the student sample of the “attractive comparison other” condition in study 1 from Schwinghammer et al. (2006) (see appendix 1). Based on theoretical reasoning and clinical experience we made a conservative estimate of no change in our dependent variables between attention conditions for people with BDD. The difference in difference scores was therefore $1.17 - 0 = 1.17$. A standard deviation of the difference score of 1.06 was assumed (based on the more conservative SD from the abovementioned conditions in study 1 from Schwinghammer et al., 2006). It was also assumed that the correlation between the repeated measures variable (attention condition) was one of 0.5. We therefore expected an effect size of the interaction of $1.17/1.06 = 1.10$. Given that this was a large but estimated effect size due to changes in method (including both the experimental procedure and the participant group; i.e. BDD), a more conservative effect size of 0.8 was used. To have 80% power to detect such an effect we required 26 participants per group at an alpha level of .05 (2 tailed).

For the second dependent variable, *self-evaluated attractiveness compared to others*, we followed the same procedure as above using data from Schwinghammer et al.

(2006) (see appendix 1) and found an estimated effect size of the interaction of 1.13. Given again that this was a large but estimated effect size, we used the more conservative effect size of 0.8 which gave the same number of participants as above. The distribution plot from G*Power 3.0.8TM is shown in the appendix 12.

2.10 Materials

All materials were computer printed on paper and the photographic portraits were available from the first supervisor. The first supervisor had been sent the database of portraits from the original research group who had them rated objectively (Santos & Young, 2005).

2.11 Costs and budget

The main cost of recruitment (£20 per person with BDD, £10-15 per healthy control dependent on the stage of the study) was covered by the DClinPsy research budget.

2.12 Ethical considerations

The experimental manipulation and materials used in this study did not include content over and above that which people with BDD expose themselves to on a day to day basis independently. Furthermore, the experimental manipulation was not appearance-related and therefore did not directly target core BDD symptoms. Participants who wished to know were debriefed with regards to the true aims of the research following their participation.

National Research Ethics Committee (NRES; London – Camberwell St Giles) approval of this research (research ethics committee reference 11/LO/0287) was received on 24/05/11. Research and Development at the IOP in association with SLAM NHS Foundation Trust also gave approval of this research.

3.0 Results

3.1 Distribution of data

The distribution of data was assessed for each analysis to test whether or not the assumptions of normality inherent to parametric statistical analyses were met. Observations of boxplots and Q-Q plots were first made to form an initial impression of the data. The data's deviation from normality (using the Shapiro-Wilk test) and homogeneity of variance (standard deviations not >2:1 between groups; Howell, 2002) in addition to assessing for case outliers, all for each analysis. Indeed outliers have been reported as potentially misleading in data analyses (Osborne & Overbay, 2004). Outliers were defined as scores above and below 2 and -2 on de-trended normal Q-Q plots, respectively.

3.1.1 Questionnaire data

For comparative analyses where all the above assumptions were not met non-parametric analyses were used as a means of stringency. Data was not transformed as this is not considered a useful approach by all (Glass, Peckham, & Sanders, 1972).

The above assumptions were also deemed to be appropriately met for the use of a mixed (2×3) ANOVA and post hoc one-way repeated measures ANOVAs. Mauchly's test of sphericity was not significant and also the Greenhouse-Geisser epsilon score was above .7 suggesting that the sphericity assumptions of the repeated measurement ANOVA were fulfilled (Howell 2002). Sphericity assumptions were also not violated for the one-way repeated measures ANOVA for people with BDD but not for healthy controls and so in this latter analysis the Greenhouse-Geisser correction was used.

For the three 2-level factorial ANCOVA analyses which were used the homogeneity of regression slopes was also tested as this is an additional assumption of the ANCOVA (Field, 2005). The dependent variable for these analyses was the BCS. The interaction effects between participant group and each covariate (INCOM, UCS, RSES) were not significant ($F(1, 39) = .06, p = .804, \eta_p^2 = .00, F(1, 39) = .00, p =$

.959, $\eta_p^2 = .00$, and $F(1, 39) = 1.24$, $p = .272$, $\eta_p^2 = .03$, respectively). These non-significant test results further justified the use of the ANCOVA. It is noted that the Shapiro-Wilk test was significant ($p = .02$) for the distribution of the UCS in people with BDD. Given that all other assumptions were met for both groups the three 2-level factorial ANCOVA was considered robust enough for usage.

Observations of scatterplots were made before Person's r correlations were considered suitable for use.

In testing for associations between the categorical variables of demographic details and participant group (people with BDD, healthy controls) the minimum expected cell frequency of >5 assumption of the Pearson chi-square (χ^2) test was not violated. The χ^2 test was therefore reported for each comparison.

3.1.2 Experiment

In keeping with the use of mixed (2×2) ANOVAs for the main analyses, the distribution of change scores (defined by the difference in each dependent variable between the levels of the within subject factor of attention condition) were assessed for each group. All assumptions (i.e. as per section 3.3) were met for these change scores on the first dependent variable for both mean scores of the photo ratings and also for when the change scores were isolated to the first photos following each attention condition. The same procedure was followed for the second dependent variable. It is noted that the Shapiro-Wilk test was significant for the change scores for mean scores of the photo ratings in people with BDD and for both groups when the change scores were isolated to the first photos following each attention condition. In the context of all other assumptions being met however mixed ANOVAs were deemed robust enough for usage and preferable to transformations (Glass et al., 1972).

In testing for associations between the categorical variables of participant group (people with BDD, healthy controls) and those used in the manipulation checks the minimum expected cell frequency of >5 assumption of the Pearson chi-square (χ^2) test was violated. The Fisher's exact test (FET) was therefore reported.

3.2 Demographics

See table 1 for the demographic details of the people with BDD and healthy controls. The group of people with BDD consisted of just over half males (56.5%) and the healthy control group was 50% male. There was no significant association between participant group (people with BDD, healthy controls) and gender ($\chi^2(1) = .18, p = .764$, exact, 2 sided, Cramer's $V = .07$). In terms of marital status the majority of people with BDD were single (65.2%) as were the majority of healthy controls (55%). There was no significant association between participant group (people with BDD, healthy controls) and marital status (single vs. relationship) ($\chi^2(1) = 1.69, p = .219$, exact, 2 sided, Cramer's $V = .20$). In terms of ethnicity the majority of people with BDD were white (European / Anglo-American) (65.2%) as were the majority of healthy controls (75%). There was no significant association between participant group (people with BDD, healthy controls) and ethnicity (white, non-white) ($\chi^2(1) = .49, p = .53$, exact, 2 sided, Cramer's $V = .11$).

The group of people with BDD was mainly unemployed (52.2%) whereas the healthy control group was mainly employed (90%). There was a significant association between occupation (employed vs. unemployed) and participant group (people with BDD, healthy controls) ($\chi^2(1) = 8.67, p = .004$, exact, 2 sided, Cramer's $V = .45$). The group of people with BDD was mainly educated to at least degree level (34.8%) as was the majority of the healthy control group (80%). There was a trend towards significance for an association between participant group (people with BDD, healthy controls) and education (non degree, degree) ($\chi^2(1) = 4.74, p = .056$, exact, 2 sided, Cramer's $V = .33$). In addition, age was not statistically significant between people with BDD and the healthy control group ($U = 214.50, p = .713$, exact, 2-sided). This result was below a small effect size ($r = -.06$).

Table 1. Demographic details as a function of participant group.

	People with BDD		Healthy controls	
	n	%	n	%
Gender				
Male	13	56.5	10	50.0
Female	10	43.5	10	50.0
Marital status				
Single	17	73.9	11	55.0
Single (never married)	15	65.2	11	55.0
Separated/Divorced	2	8.7	0	0.0
Relationship	6	26.1	9	45.0
Married	1	4.3	4	20.0
Cohabiting/Living together	2	8.7	4	20.0
Other	3	13.0	1	5.0
Ethnicity				
White (European/ Anglo-American)	15	65.2	15	75.0
Non-white (see below)	8	34.8	5	25.0
Black – Caribbean	1	4.3	0	0.0
Black - African	0	0.0	1	5.0
South Asian	3	13.0	0	0.0
East Asian	0	0.0	0	0.0
Hispanic	0	0.0	1	5.0
Other	4	17.4	3	15.0
Occupation				
Employed	11	47.8	18	90.0
Job	9	39.1	15	75.0
Student	2	8.7	3	15.0
Unemployed	12	52.2	2	10.0
Education				
Non degree	12	52.2	4	20.0
Primary	1	4.3	1	5.0
Secondary	1	4.3	0	0.0
O-levels / GCSE's	1	4.3	0	0.0
A-levels (or equivalents)	7	30.4	2	10.0
Tertiary (non-degree)	2	8.7	0	0.0
Other	0	0.0	1	5.0
Degree	11	47.8	16	80.0
Tertiary (degree level)	8	34.8	10	50.0
Postgraduate	3	13.0	6	30.0
	M	S.D.	M	S.D.
Age				
Years	32.11	8.28	30.98	7.33

Note. BDD, Body Dysmorphic Disorder; *n*, number; M, mean; S.D., standard deviation.

3.3 Standardised measures

3.3.1 Body image questionnaires

See table 2 for body image and comparing data for people with BDD and healthy controls.

MBSRQ-AS

Appearance evaluation: As expected, people with BDD had significantly lower appearance-evaluations relative to healthy controls ($t(41) = -9.63$, $p < .001$, 2-sided). This result had a large effect size ($r = -.83$).

Appearance orientation: People with BDD ($Mdn = 4.33$) also had a significantly greater investment in their appearance relative to healthy controls ($Mdn = 3.08$) ($U = 80.00$, $p < .001$, exact, 2-sided). This result had a large effect size ($r = -.56$).

Body areas satisfaction: People with BDD ($Mdn = 2.33$) also had significantly lower satisfaction with discrete aspects of appearance relative to healthy controls ($Mdn = 3.67$) ($U = 49.00$, $p < .001$, exact, 2-sided). This result had a large effect size ($r = -.67$).

Overweight preoccupation: There was no significant difference in preoccupation with becoming overweight between people with BDD ($Mdn = 2.00$) and healthy controls ($Mdn = 1.75$) however ($U = 187.00$, $p = .298$, exact, 2-sided). This result had a small effect size ($r = -.16$).

Self-classified weight: There was also no significant difference in perceptions of weight between people with BDD ($Mdn = 3.00$) and healthy controls ($Mdn = 3.00$) ($U = 198.00$, $p = .421$, exact, 2-sided). This result had a small effect size ($r = -.12$). The above two results are in keeping with the exclusion criterion of current eating disorders.

BCS

Body comparisons: In keeping with hypothesis 1 people with BDD reported a significantly higher frequency of body comparisons with other individuals of the same sex relative to healthy controls ($t(41) = 3.18, p = .003$, 2-sided). This result was close to a large effect size ($r = .44$).

BDD-YBOCS

BDD symptomatology: The mean level of BDD symptoms reported by people with BDD was in keeping with a moderate level of severity (Phillips et al., 1997).

3.3.2 Social comparison orientation

INCOM

Social comparison orientation: There was no significant difference in social comparison orientation between people with BDD and healthy controls ($t(41) = .91, p = .370$, 2-sided). This result had a small effect size ($r = .14$).

Upwards social comparison orientation: There was a significantly greater orientation towards upwards social comparisons in people with BDD ($Mdn = 25.00$) relative to healthy controls ($Mdn = 20.50$) ($U = 123.50, p = .009$, exact, 2-sided). This result had a medium effect size ($r = -.40$).

Downwards social comparison orientation: There was no significant difference in orientation towards downwards social comparisons between people with BDD and healthy controls ($t(41) = -.45, p = .657$, 2-sided). This result was below a small effect size ($r = -.07$).

Table 2. Body image and comparing data as a function of participant group.

	People with BDD		Healthy controls	
	M	S.D.	M	S.D.
MBSRQ-AS				
Appearance evaluation	2.02	.68	3.79	.49
Appearance orientation*	4.04	.73	3.17	.56
Body areas satisfaction*	2.62	1.06	3.84	1.07
Overweight preoccupation*	2.18	.91	1.93	.78
Self-classified weight*	3.09	.62	3.98	3.35
BCS				
Total	93.39	23.50	72.65	18.47
INCOM				
Main scale	39.22	6.08	37.50	6.32
INCOM UCS*	23.65	4.93	19.35	6.29
INCOM DCS	16.04	5.09	16.70	4.43
BDD-YBOCS				
Total items 1-12	33.74	5.01	-	-

Note. BDD, Body Dysmorphic Disorder; M, mean; S.D., standard deviation; MBSRQ-AS, Multidimensional Body-Self Relations Questionnaire – Appearance Subscales, range, 1-5; BCS, Body Comparison Scale, range, 36-180; INCOM, Iowa-Netherlands Comparison Orientation Measure, range, 11-55; UCS, Upwards Comparisons Scale, range, 6-30; Downwards Comparisons Scale, range, 6-30; BDD-YBOCS, Yale-Brown Obsessive Compulsive Scale for Body Dysmorphic Disorder, range, 0-48. * = Medians reported in text due to use of nonparametric tests.

3.3.3 Mental health and self-esteem

See table 3 for mental health and self-esteem data for people with BDD and healthy controls.

HADS

Anxiety: People with BDD ($Mdn= 12.00$) had significantly higher levels of anxiety relative to healthy controls ($Mdn= 2.00$) ($U = 7.00$, $p < .001$, exact, 2-sided). This result had a large effect size ($r = -.83$).

Depression: People with BDD ($Mdn = 10.00$) had significantly higher levels of depression relative to healthy controls ($Mdn = 1.00$) ($U = 6.00$, $p < .001$, exact, 2-sided). This result had a large effect size ($r = -.84$).

Global self-esteem: People with BDD had significantly lower global self-esteem relative to healthy controls ($t(41) = -13.17$, $p < .001$, 2-sided). This result had a large effect size ($r = -.90$). Please see section 5.3.6 (Part 4 of the present investigation) for further investigation of self-esteem.

Table 3. Mental health and self-esteem data as a function of participant group.

	People with BDD		Healthy controls	
	M	S.D.	M	S.D.
HADS				
Anxiety*	11.57	4.01	2.50	2.16
Depression*	9.91	3.79	1.75	1.97
RSES				
Global self-esteem	9.04	4.23	25.25	3.78
Self-competence*	6.04	2.88	13.30	1.49
Self-liking*	3.00	2.02	11.95	3.00

Note. BDD, Body Dysmorphic Disorder; M, mean; S.D., standard deviation; HADS, Hospital Anxiety and Depression Scale, anxiety range, 0-21, depression range, 0-21; RSES, Rosenberg Self-Esteem Scale, range, 0-30. (Ranges for self-liking and self-competence are 0-15). * = Medians reported in text due to use of nonparametric tests.

3.3.4 Hypothesis 1: Exploring the nature of A-RCs in BDD

See table 4 for data on the nature of appearance-related comparisons (A-RCs) in people with BDD and healthy controls gathered from the newly devised measure called the Physical Appearance-Related Comparisons Scale (PA-RCS). The PA-RCS was used to explore hypothesis 1.

PA-RCS

Comparisons of overall appearance and specific features

Comparison of overall appearance: In keeping with hypothesis 1 people with BDD ($Mdn = 80$) reported a significantly higher frequency of A-RCs of overall appearance

to others of the same sex relative to healthy controls ($Mdn= 37.25$) ($U= 49.50$, $p < .001$, exact, 2-sided). This result had a large effect size ($r = -.67$).

Comparison of specific features: In keeping with hypothesis 1 people with BDD ($Mdn= 92.50$) reported a significantly higher frequency of A-RCs of specific facial or body features that they are most concerned about to that in others of the same sex relative to healthy controls ($Mdn= 22.50$) ($U= 30.50$, $p < .001$, exact, 2-sided). This result had a large effect size ($r = -.74$).

Physical attractiveness rating of other compared to own physical attractiveness:

People with BDD ($Mdn= 90.50$) generally rated/judged the physical attractiveness of others of the same sex (*in general*) with a significantly higher level of physical attractiveness compared to their own physical attractiveness relative to healthy controls ($Mdn= 47.00$) ($U= 33.50$, $p < .001$, exact, 2-sided). This result had a large effect size ($r = -.73$). This result is in keeping with the results above showing that people with BDD tend to rate same sex targets of A-RCs as more physically attractive (i.e. in an upwards direction) relative to healthy controls.

Body satisfaction after A-RCs

Satisfaction after comparing: People with BDD ($Mdn= 12.50$) reported being significantly less satisfied with their physical appearance after comparing to the physical appearance of others of the same sex relative to healthy controls ($Mdn= 50.00$) ($U= 31.50$, $p < .001$, exact, 2-sided). This result had a large effect size ($r = -.75$).

Automaticity of A-RCs

Comparing without at first realising: People with BDD ($Mdn= 75.00$) reported significantly more frequently finding themselves comparing their physical appearance to someone of the same sex for a while without at first realising relative to healthy controls ($Mdn= 19.25$) ($U= 75.50$, $p < .001$, exact, 2-sided). This result had a large effect size ($r = -.57$). This result supports hypothesis 1.

Automatic comparing without clear aim: People with BDD ($Mdn= 70.00$) reported significantly more often finding themselves comparing their physical appearance to

someone of the same sex automatically without a clear aim relative to healthy controls ($Mdn= 19.75$) ($U= 79.50$, $p < .001$, exact, 2-sided). This result had a large effect size ($r = -.56$). This result supports hypothesis 1.

Table 4. Data on the nature of A-RCs as a function of participant group.

	People with BDD		Healthy controls	
	M	S.D.	M	S.D.
PA-RCS				
Comparison of overall appearance*	75.35	25.03	33.15	21.65
Comparison of specific features*	85.63	19.83	32.40	23.99
Physical attractiveness rating of other compared to own physical attractiveness*	83.09	19.69	41.00	15.36
Satisfaction after comparing*	18.20	15.61	50.23	7.27
Comparing without at first realising*	68.98	31.94	27.58	25.04
Automatic comparing without clear aim*	65.50	32.16	25.75	25.13

Note. A-RCs, Appearance-Related Comparisons; BDD, Body Dysmorphic Disorder; M, mean; S.D., standard deviation; PA-RCS, Physical Appearance-Related Comparisons Scale, item range, 0-100. * = Medians reported in text due to use of nonparametric tests.

The attractiveness of comparison targets (Direction of A-RCs)

See figure 2 for a graph illustrating the results of the attractiveness of comparison targets (direction of A-RCs) in people with BDD and healthy controls.

A two-way participant group (people with BDD, healthy controls) \times attractiveness of comparison target (unattractive, average, attractive) mixed ANOVA showed that there was a significant main effect of participant group ($F(1, 41)= 23.25$, $p < .0001$, $\eta_p^2= .36$). This replicated the earlier finding of a significantly higher frequency of body comparisons in people with BDD relative to healthy controls on the BCS. There was also a significant main effect of attractiveness of comparison target ($F(2, 82)= 10.04$, $p < .0001$, $\eta_p^2= .20$). There was also a significant interaction effect between participant group and attractiveness of comparison target ($F(2, 82)= 3.08$, $p = .051$, $\eta_p^2= .07$).

The interaction was investigated further with one-way (attractiveness of comparison target (unattractive, average, attractive) repeated measures ANOVA post hoc

analyses for each participant group. For people with BDD there was a significant main effect of attractiveness of comparison target ($F(2, 44) = 8.35, p = .001, \eta_p^2 = .28$). Pairwise comparison contrasts showed that this significant effect was driven by a significantly lower frequency of body comparisons to unattractive targets of comparison relative to both average and attractive targets of comparison in people with BDD ($p = .01$; $p = .002$, respectively). Frequencies of body comparisons to average and attractive targets of comparison were not significantly different in people with BDD however ($p = .249$). For healthy controls there was a non-significant main effect of attractiveness of comparison target ($F(1.37, 26.01) = .282, p = .094, \eta_p^2 = .129$). This result supports hypothesis 1.

Figure 2.

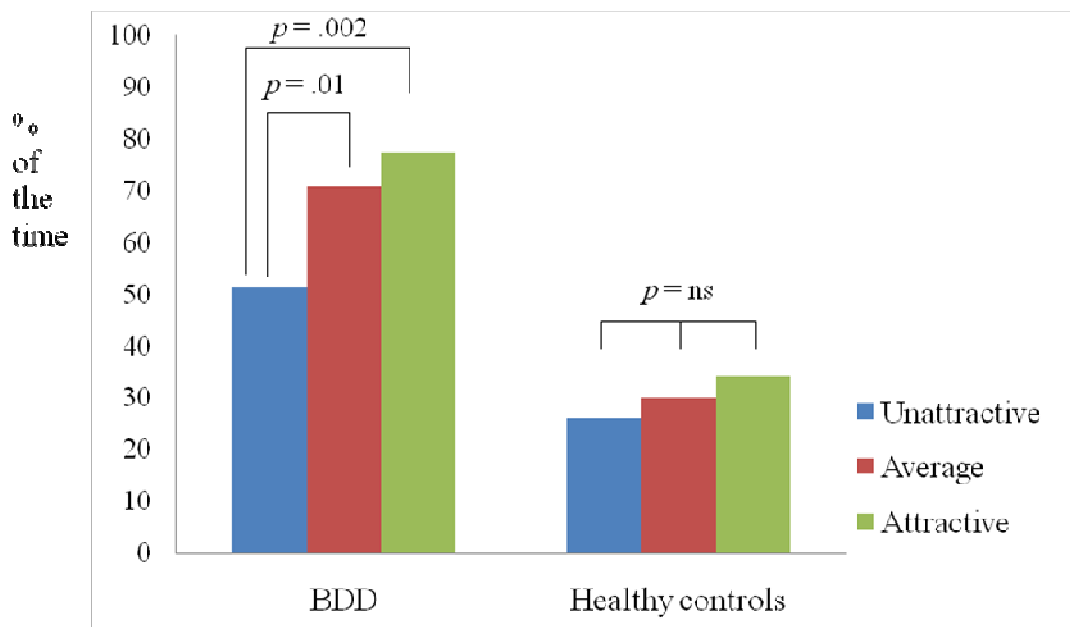


Figure 2. The attractiveness of comparison targets (direction of A-RCs) in people with BDD and healthy controls.

3.3.5 Hypothesis 2: Exploring the specificity of A-RCs in BDD

Hypothesis 2 was explored using data from the Body Comparisons Scale (BCS), Iowa-Netherlands Comparison Orientation Measure (INCOM), and the Rosenberg Self-Esteem Scale (RSES).

Covarying for social comparison orientation: The significantly higher frequency of body comparisons in people with BDD relative to healthy controls withstood covariance for social comparison orientation in a 2-level factorial ANCOVA, ($F(1, 40) = 8.92$, $p = .005$, $\eta^2 = .18$). The significantly higher frequency of body comparisons in people with BDD relative to healthy controls was therefore not driven by a more general difference in social comparison orientation. This result supports hypothesis 2.

Covarying for upwards social comparison orientation: Earlier results suggested that A-RCs in both healthy controls and people with BDD in particular are mainly directed upwards. An analysis was therefore used to test if the higher frequency of body comparisons in people with BDD relative to healthy controls withstood covariance for upwards social comparison orientation. The significantly higher frequency of body comparisons in people with BDD relative to healthy controls withstood covariance for upwards social comparison orientation in a 2-level factorial ANCOVA, ($F(1, 40) = 6.31$, $p = .016$, $\eta_p^2 = .14$). The difference showing that people with BDD more often engage in body comparisons relative to healthy controls was therefore not driven by a more general difference in upward social comparison orientation. This result supports hypothesis 2.

Covarying for global self-esteem: Research has shown that people with low self-esteem are more interested in social comparisons. An analysis was therefore used to test if the higher frequency of body comparisons in people with BDD relative to healthy controls withstood covariance for global self-esteem. The significantly higher frequency of body comparisons in people with BDD relative to healthy controls withstood covariance for global self-esteem in a 2-level factorial ANCOVA, ($F(1, 40) = 4.39$, $p = .042$, $\eta_p^2 = .10$). The difference showing that people with BDD more often engage in body comparisons relative to healthy controls was therefore not driven by a more general difference in global self-esteem. This result supports hypothesis 2.

3.3.6 Exploring beliefs about the functions of A-RCs

See table 5 for the data on the beliefs about the functions of appearance-related comparisons (A-RCs) in people with BDD and healthy controls. This data was gathered from the newly devised measure called the Beliefs about Appearance-Related Comparisons Subscales (BA-RCS).

Comparing to check/verify for self-evaluation: People with BDD ($Mdn = 73.63$) reported significantly stronger agreement with A-RCs as a means of checking or verifying for self-evaluative purposes relative to healthy controls ($Mdn = 33.31$) ($U = 47.00$, $p < .001$, exact, 2-sided). This result had a large effect size ($r = -.68$).

Comparing to put something right through self-enhancement: There was no significant difference in agreement between people with BDD and healthy controls regarding A-RCs as a means of putting something right through self-enhancement ($t(41) = 1.61$, $p = .114$, 2-sided). This result was close to a medium effect size ($r = .24$).

Comparing to put something right through self-improvement: There was no significant difference in agreement between people with BDD and healthy controls regarding A-RCs as a means of put something right through self-improvement ($t(41) = 1.61$, $p = .114$, 2-sided). This result was close to a medium effect size ($r = .24$).

Comparing as self-loathing: People with BDD ($Mdn = 74.00$) reported significantly stronger agreement with A-RCs as a means of self-loathing relative to healthy controls ($Mdn = 8.88$) ($U = 18.00$, $p < .001$, exact, 2-sided). This result had a large effect size ($r = -.79$).

Comparing as threat management: People with BDD ($Mdn = 59.88$) reported significantly stronger agreement with A-RCs as a means of threat management relative to healthy controls ($Mdn = 10.00$) ($U = 36.50$, $p < .001$, exact, 2-sided). This result had a large effect size ($r = -.72$).

Effect sizes showed that the biggest differences between groups were for people with BDD to report stronger agreement with beliefs about A-RCs as means of self-evaluation, self-loathing, and threat management relative to healthy controls.

Table 5. Data on beliefs about the functions of A-RCs as a function of participant group.

	<u>People with BDD</u>		<u>Healthy controls</u>	
	<u>M</u>	<u>S.D.</u>	<u>M</u>	<u>S.D.</u>
BA-RCS				
Comparing to check/verify for self-evaluation*	70.23	20.38	34.63	17.94
Comparing to put something right through self-enhancement	46.84	24.09	35.51	21.60
Comparing to put something right through self-improvement	54.46	26.00	43.14	18.70
Comparing as self-loathing*	66.57	26.01	13.27	16.36
Comparing as threat management*	57.83	29.19	11.13	11.97

Note. A-RCs, Appearance-Related Comparisons; BDD, Body Dysmorphic Disorder; M, mean; S.D., standard deviation; BA-RCS; Beliefs about Appearance-Related Comparisons Subscales, range 0-100. * = Medians reported in text due to use of nonparametric tests.

3.3.7 Hypothesis 3: Investigating the self-serving A-RCs bias

See table 6 for the experimental data on the investigation of the self-serving A-RCs bias in people with BDD and healthy controls. This data was gathered from the author's novel experimental design based on Schwinghammer et al. (2006).

The general attractiveness of others

Mean photo ratings: A two-way (participant group \times attention condition) mixed ANOVA showed that there was a non-significant main effect of participant group ($F(1, 40) = 3.35, p = .075, \eta_p^2 = .08$). This result however showed a trend towards significance for people with BDD to rate the general attractiveness of others as more physically attractive relative to healthy controls, in keeping with Buhlmann et al. (2008). There was also no significant main effect of attention condition ($F(1, 40) = 1.92, p = .174, \eta_p^2 = .05$). There was also a no significant interaction effect between

participant group and attention condition ($F(1, 40) = .13, p = .725, \eta_p^2 = .00$). This result indicated that there was no difference between people with BDD and healthy controls in the processing of information about the physical attractiveness of others contingent on self-focused attention (S-FA). The result therefore indicated an acceptance of the null hypothesis 3.

First photo ratings: A two-way (participant group \times attention condition) mixed ANOVA showed that there was no significant main effect of participant group ($F(1, 40) = .42, p = .522, \eta_p^2 = .01$). There was also no significant main effect of attention condition ($F(1, 40) = 2.39, p = .130, \eta_p^2 = .06$). There was also no significant interaction effect between participant group and attention condition ($F(1, 40) = .28, p = .599, \eta_p^2 = .01$). This result further indicated that there was no difference between people with BDD and healthy controls in the processing of information about the physical attractiveness of others contingent on S-FA. The result therefore indicated an acceptance of the null hypothesis 3.

Self-evaluated attractiveness compared to others

Mean photo ratings: A two-way (participant group \times attention condition) mixed ANOVA showed that there was a significant main effect of participant group showing that people with BDD had lower ratings of self-evaluated attractiveness compared to others relative to healthy controls ($F(1, 40) = 55.21, p < .001, \eta_p^2 = .58$). There was however no significant main effect of attention condition ($F(1, 40) = 1.78, p = .190, \eta_p^2 = .04$). There was also no significant interaction effect between participant group and attention condition ($F(1, 40) = .13, p = .720, \eta_p^2 = .00$). This result indicated that there was no difference between people with BDD and healthy controls in the processing of appearance-related comparison information contingent on S-FA. The result therefore indicated an acceptance of the null hypothesis 3.

First photo ratings: A two-way (participant group \times attention condition) mixed ANOVA showed that there was a significant main effect of participant group showing that people with BDD had lower ratings of self-evaluated attractiveness compared to others relative to healthy controls ($F(1, 40) = 41.79, p < .001, \eta_p^2 = .51$). There was however no significant main effect of attention condition ($F(1, 40) = 3.12, p = .085, \eta_p^2 = .07$). There was also no significant interaction effect between

participant group and attention condition ($F(1, 40) = 2.09, p = .156, \eta_p^2 = .05$). This result further indicated that there was no difference between people with BDD and healthy controls in the processing of appearance-related comparison information contingent on S-FA. The result therefore indicated an acceptance of the null hypothesis 3.

Manipulation checks

Control attention condition: In the control attention condition manipulation check there was “evidence of engaging with the task only” in $n = 20$ (100%) of the healthy controls and $n = 21$ (95.5%) of the people with BDD. There was however a “possible contamination of explicit S-FA (e.g. mention of appearance concern)” in $n = 1$ (4.5%) person with BDD. This differential influence was not statistically significant however (FET: $p = 1.00$, 2-sided, Cramer’s $V = .15$).

Self-focused attention: In the S-FA condition there was “evidence of engaging with the task only” in $n = 20$ (100%) of the healthy controls and $n = 14$ (63.6%) people with BDD. There was however a “possible contamination of explicit S-FA (e.g. mention of face/ appearance concern/ or reflection)” in $n = 8$ (36.4%) people with BDD suggesting a substantial differential influence of the vignette in people with BDD relative to that seen in the healthy controls. This differential influence was statistically significant (FET: $p = .004$, 2-sided, Cramer’s $V = .46$).

3.3.7 Hypothesis 4: Exploratory analyses on self-esteem in BDD

Hypothesis 4 was explored using data from the Rosenberg Self-Esteem Scale (RSES). See table 3 for the data on the divisions of self-esteem in people with BDD and healthy controls.

Self-competence

People with BDD ($Mdn = 6.00$) reported significantly lower self-competence relative to healthy controls ($Mdn = 13.00$) ($U = 1.50, p < .001$, exact, 2-sided). This result had a large effect size ($r = -.85$).

Self-liking

People with BDD ($Mdn = 3.00$) reported significantly lower self-liking relative to healthy controls ($Mdn = 13.00$) ($U = 1.50$, $p < .001$, exact, 2-sided). This result had a large effect size ($r = -.85$). Effect sizes showed that differences between groups were the same size for self-competence and self-liking suggesting an acceptance of the null hypothesis 4.

Table 6. Experimental data as a function of participant group and attention condition.

	<u>People with BDD</u>		<u>Healthy controls</u>		<u>Combined groups</u>	
	<u>M</u>	<u>S.D.</u>	<u>M</u>	<u>S.D.</u>	<u>M</u>	<u>S.D.</u>
DV 1:						
The general attractiveness of others						
<i>CAC mean photo ratings</i>	73.92	14.06	68.20	8.95	71.19	12.11
<i>SFA mean photo ratings</i>	72.50	12.52	65.81	10.90	69.31	12.11
<i>Combined attention mean photo ratings</i>	73.21	12.78	67.00	8.54	70.25	11.29
<i>CAC first photo ratings</i>	67.73	14.85	66.65	12.85	67.21	13.77
<i>SFA first photo ratings</i>	65.34	13.97	61.78	13.77	63.64	13.82
<i>Combined attention first photo ratings</i>	66.53	12.35	64.21	10.79	65.43	11.55
DV 2:						
Self-evaluated attractiveness compared to others						
<i>CAC mean photo ratings</i>	35.42	14.65	6.86	9.30	21.82	18.93
<i>SFA mean photo ratings</i>	34.18	16.05	4.71	11.63	20.15	20.41
<i>Combined attention mean photo ratings</i>	34.80	14.73	5.78	9.82	20.98	19.26
<i>CAC first photo ratings</i>	32.84	16.55	6.70	15.83	20.39	20.76
<i>SFA first photo ratings</i>	32.14	18.11	-.35	14.27	16.67	23.07
<i>Combined attention first photo ratings</i>	32.49	16.23	3.18	12.73	18.53	20.73

Note. DV, dependent variable; CAC, control attention condition; SFA, self-focused attention; BDD, Body Dysmorphic Disorder; M, mean; S.D., standard deviation. DV 1 range, 0-100; DV 2 range -50-+50.

4.0 Discussion

4.1 Overview

The present investigation studied self-focused attention (S-FA) and appearance-related comparisons (A-RCs) in people with body dysmorphic disorder (BDD). The overarching rationale for this investigation was that both S-FA and A-RCs are purported to be key distress maintenance factors in BDD according to the information processing cognitive-behavioural model proposed by Veale (2004) and Veale and Neziroglu (2010). The author therefore addressed the limited research on these constructs in people with BDD. Hypotheses 1 and 2 of the present investigation used a questionnaire based design to explore both the nature (frequency, direction, and automaticity) and specificity of A-RCs in people with BDD relative to healthy controls. The exploration of these hypotheses was deemed important because aspects of A-RCs may contribute to distress maintenance and cognitive-behavioural models should be as specific as possible for effective treatment to follow. The present investigation then used a newly devised questionnaire to investigate the beliefs held about the functions of A-RCs in people with BDD relative to healthy controls. Beliefs about engaging in behavioural processes, for example in anxiety disorders, can often lead to further engagement with them resulting in a maintenance of feared outcomes and associated distress (Salkovskis, 1991). Addressing beliefs about A-RCs was therefore considered to be another aspect of the present investigation which would be informative for cognitive-behavioural therapy.

In order to explore hypothesis 3 the author used a novel experimental design to hypothesis test for the possible lack of a self-serving appearance-related bias in people with BDD relative to healthy controls (Lambrou et al., 2011). This experiment was considered important because it was designed to investigate a hypothesised interaction between key aspects of BDD phenomenology namely- S-FA and A-RCs. To the best of the author's knowledge the present investigation is the first study of self-serving A-RCs biases in people with BDD relative to healthy controls. The author tested the main hypothesis with a manipulation of implicit S-FA. The inclusion of this manipulation was important given the paucity of research on implicit processing in people with BDD, despite an assertion that such processing maintains anxiety pathology and more BDD specific symptoms (Beck & Clark,

1997; McNally, 1995; Buhlmann, et al., 2009). Hypothesis 4 of the present investigation focused on self-esteem in people with BDD because it has been found to be particularly low in this disorder (Phillips et al., 2004). Self-esteem is also recognised as a key psychological construct influenced by comparing. In particular, the divisions of self-esteem namely- self-competence and self-liking in people with BDD relative to healthy controls were investigated (Tafarodi & Milne, 2002).

4.2 Summary of findings

In summary the present investigation's questionnaire results supported its hypotheses 1 and 2 regarding the nature (frequency, direction, and automaticity) and specificity of A-RCs in people with BDD, respectively. A-RCs were more frequent, generally more upwards, and more automatic in people with BDD relative to healthy controls. The higher frequency of A-RCs in people with BDD could also not be attributed to more general constructs related to comparing. In using a newly developed measure results also uncovered some beliefs about A-RCs in people with BDD. These results suggested that people with BDD, more so than healthy controls, believe that A-RCs are a means of self-evaluation, self-loathing (a way to confirm beliefs about physical unattractiveness) and a means through which they can manage current social threats. The present investigation however did not find evidence to suggest that either healthy controls or people with BDD show a self-serving A-RCs bias contingent on S-FA contrary to its main experimental hypothesis. In addition the present investigation did not find evidence that the divisions of self-esteem, self-liking and self-competence, were disproportionately effected in BDD relative to healthy controls, contrary to its final hypothesis.

Each part of the present investigation led by its research questions and hypotheses will now be discussed in turn before addressing limitations of the research. The discussion will then address the present investigation's clinical implications and future directions for research before concluding.

4.3 Hypothesis 1: Exploring the nature of A-RCs in BDD

In keeping with hypothesis 1 A-RCs were found to be more frequent in people with BDD relative to healthy controls. This result offers some support for the notion that A-RCs are another one of the compulsive behaviours engaged in by people with BDD. It is more interesting however that an interaction emerged between participant group and the frequency of A-RCs when this was reported on as per the perceived attractiveness of the target of comparison. When this interaction was investigated further it was found that people with BDD reported engaging in A-RCs significantly more with both attractive and average others relative to unattractive others. This finding is in keeping with Festinger's (1954) original theory which proposed a "unidirectional drive upwards" in the social comparison processes of abilities (p. 124). There were no significant differences in the frequencies of different directions of A-RCs in healthy controls however. These more substantial findings relating to the direction of A-RCs were also in keeping with the result showing that people with BDD reported rating targets of A-RCs as more physically attractive than themselves relative to healthy controls. The data therefore supported hypothesis 1 which stated that A-RCs would be generally more upwards in people with BDD relative to healthy controls.

The above findings therefore suggest that Cash's (1991, 2008) "unfair to compare" cognitive bias is found in people with BDD relative to healthy controls. It is interesting to consider what these findings mean when applying Festinger's (1954) theory of social comparison processes. Festinger (1954) proposed that people tend to make social comparisons only with those that allow subjectively accurate self-evaluations. Indeed Festinger stated that when social comparisons are not deemed to give accurate feedback for the self the comparing ceases. In this context the present findings suggest that people with BDD continue to perceive their A-RCs as offering useful self-evaluations despite them being generally more upwards relative to healthy controls. Moreover the present findings imply that healthy controls refrain from A-RCs at a lower ceiling of perceived physical attractiveness relative to people with BDD. Indeed it has been stated that social comparison activity is sometimes refrained from or curtailed when people become aware that they are not faring well (Buunk, Schaufeli, & Ybenma, 1994; Gibbons, Benbow, & Gerrard, 1994).

For people with BDD however such curtailment in A-RCs, at least relative to healthy controls, does not appear to occur to a similar extent. It therefore makes sense that people with BDD reported being generally much less satisfied with their appearance after comparing as again it appears that they continue to engage with more upwards A-RCs beyond the norm. Theories of body image disturbance propose that A-RCs are a core factor in the development and maintenance of distorted body image (e.g. Stormer & Thompson, 1996; Cash, 1997). The present investigation's results on the nature of A-RCs in BDD appear to be in keeping with such theories. The question then becomes why does the same curtailment in A-RCs not occur in people with BDD relative to controls? It might be that through the very nature of the disorder, as defined by perceived flaws, most targets of A-RCs are expected to be of a more upwards direction. People with BDD might therefore continue to see the information these A-RCs offer as relevant to subjectively accurate self-evaluations. This interpretation fits well with the present investigation's finding that people with BDD believe that they can use A-RCs as a means of a confirmation bias of their perceived flaws- this finding will be returned to later. It is also known that people with BDD can have highly perfectionistic thinking (Buhlmann et al., 2008). Such perfectionism might also be relevant to the targets of A-RCs chosen in people with BDD. The present findings however did not find significant differences in the frequency of A-RCs between average and attractive targets of comparison in people with BDD.

In keeping with hypothesis 1 the present investigation also found that people with BDD engage in A-RCs relating to both their overall appearance and the specific facial or body features that they are most concerned about with a significantly higher frequency relative to healthy controls. The effect sizes however show that the difference between groups was larger for A-RCs of the specific facial or body features of concern. This finding is in keeping with the current diagnostic thinking for BDD and indeed that which has been proposed for the DSM-V (APA, 2000; Phillips et al., 2010). The finding is also supported by evidence of an attentional bias in people with BDD for selecting the area of perceived defect in observations of unfamiliar faces (Grochowski et al., 2012). In summary of this section it would seem that more frequent, generally more upwards A-RCs, and A-RCs of specific perceived flaws are particularly pertinent to appearance comparing in BDD. These findings are unlikely to be in reference to mutually exclusive instances of A-RCs in

this disorder. That is, focusing on specific facial features of concern in the observed other is likely to be followed by an appraisal of them as being more attractive hence creating an abundance of more upwards A-RCs. The proposed link between focusing on specific facial features of concern and subsequent appraisals of more upwards A-RCs is built on in section 4.5.

In keeping with hypothesis 1 A-RCs were also found to be more automatic in people with BDD relative to healthy controls. This finding is important because research has shown that the habitual (i.e. automatic) component of negative body image thinking about appearance predicts body dissatisfaction over and above the negative content of such thinking (Verplanken & Tangelder, 2011). This research also found that the habitual component of negative thinking about appearance also accounted for low self-esteem over and above thought content when controlling for body dissatisfaction. The highly automatic nature of A-RCs in people with BDD is therefore likely to be adding to the maintenance of their body image disturbance and associated negative affective states.

4.4 Hypothesis 2: Exploring the specificity of A-RCs in BDD

The present investigation endeavoured to build on the result showing that A-RCs are more frequent in people with BDD relative to healthy controls (e.g. Anson, 2008). In addition to replicating this finding it was explored further for its specificity. Analyses were therefore aimed at showing whether or not the higher rates of A-RCs in people with BDD relative to healthy controls could be attributed to less disorder specific constructs. Social comparison orientation was firstly chosen as a covariate because some research suggests that there is variation in a psychological predisposition towards social comparing- a phenomenon commonly found in the general population (Buunk & Mussweiler, 2001; Gibbons & Buunk, 1999).

In keeping with hypothesis 2 the significantly higher frequency of A-RCs in people with BDD relative to healthy controls withstood covariance for the more general construct of social comparison orientation. This therefore suggests that people with BDD are not driven to make A-RCs more often than healthy controls merely as part of a broader picture of being more generally orientated towards making social

comparisons. A subsequent analysis found that people with BDD had a greater orientation towards upwards social comparisons relative to healthy controls. A post-hoc analysis was therefore also performed using upwards social comparisons as a covariate. Indeed it made sense to run this analysis especially when considering that results had also shown that the higher frequencies of ARCs in people with BDD relative to healthy controls were most pronounced in more upwards A-RCs. Furthermore, there is evidence to show that significantly higher levels of upwards social comparisons are endorsed in another disorder characterised by body dissatisfaction (Anorexia Nervosa) relative to student controls in domains other than physical attractiveness (Troop, et al., 2003). The significantly higher frequency of A-RCs in people with BDD relative to healthy controls however again withstood covariance. It would therefore seem that the higher frequencies of A-RCs found in people with BDD relative to healthy controls is not subsumed by their more general difference in orientation towards making more upwards social comparisons. This finding further supported hypothesis 2 regarding the specificity of A-RCs in people with BDD.

Previous research has shown that people with BDD have substantially lower self-esteem relative to healthy controls (Bohne et al., 2002; Phillips et al., 2004). People with low self-esteem have also been shown to be interested in social comparison, and specifically upwards social comparison, as a form of self-evaluative information (Wayment, & Taylor, 1995). It therefore followed that the final construct to be used as a covariate in a comparative analysis of A-RCs between people with BDD and healthy controls would be self-esteem. This difference again withstood covariance but this time for self-esteem. In a series of analyses the present investigation therefore found evidence suggesting that high frequencies of A-RCs are a specific aspect of BDD phenomenology. These results are new in the literature and support the validity of including A-RCs in the information-processing cognitive-behavioural models of BDD (Veale, 2004; Veale & Neziroglu, 2010).

4.5 Exploring beliefs about the functions of A-RCs

The present investigation also explored the phenomenology of why people with BDD engage in A-RCs relative to healthy controls. A brief but clinically relevant measure

of theory and evidence based subscales on the possible beliefs about the functions of A-RCs was generated for this purpose.

People with BDD had significantly stronger agreement with A-RCs as a means of checking/verifying for self-evaluation relative to healthy controls. The function of social comparisons originally purported by Festinger et al. (1954) therefore appears to be particularly applicable to A-RCs in the phenomenology of BDD. This finding makes sense in the context of the higher overall rates of A-RCs in people with BDD, relative to healthy controls, when the anxiety disorders literature is consulted. That is, it is known throughout the anxiety disorders literature that when behaviours such as checking or reassurance-seeking are excessively repeated ambiguity and reduced confidence in their feedback ensues (e.g. Radomsky, Shafran, Coughtrey, & Rachman, 2010). People with BDD engage in several compulsive behaviours that are likely to have this effect on their appearance concerns such as mirror checking and gazing and questioning others about their appearance (Phillips et al., 1993). The present investigation offers some suggestion that A-RCs can be added to this list; the repeated A-RCs themselves might become the source of an increased uncertainty or ambiguity about appearance which then drives a further need/ higher motivation to use A-RCs as a means of self-evaluation. Corroborating this perspective is research highlighting that interest in social comparison is associated with uncertainty (Festinger, 1954; Taylor, Buunk, & Aspinall, 1990; Wills & Suls, 1991). This vicious cycle is illustrated in figure 3.

It is also interesting to consider that occasional more favourable A-RCs would intermittently reinforce A-RCs in a similar way to what has been proposed in mirror use in people with BDD (Veale & Riley, 2001). There would appear to be some contradiction however between this and the main belief about A-RCs serving a function of confirmation bias which is described more fully hereafter. Notwithstanding, it is possible for the same behaviour to serve multiple functions. The next two potential areas of beliefs about/ functions of A-RCs were comparing to put something right through self-enhancement and to put something right through self-improvement. Self-enhancement referred to a cognitive-affective construct (i.e. A-RCs as a means of feeling better about the self) whereas self-improvement referred to a cognitive-behavioural construct (i.e. A-RCs as a means of learning what

to do/ not do to with one's appearance). People with BDD did not have a significantly higher agreement in these areas of beliefs relative to healthy controls.

Figure 3.

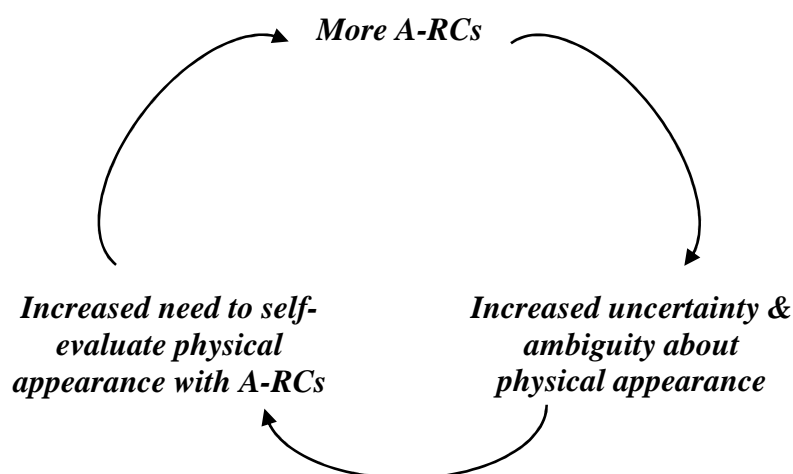


Figure 3. A vicious cycle of A-RCs as a means of self-evaluation in people with BDD.

This is interesting because these two functions of A-RCs are relatively more adaptive than the others studied. The notion that A-RCs for a function of self-improvement are relatively adaptive has some support from the literature given that they do not significantly increase body-focused anxiety relative to a no A-RCs control condition (Halliwell & Dittmar, 2005). Halliwell & Dittmar (2005) did find however that such increases in anxiety when A-RCs were focused on a function of self-evaluation. It would appear that despite the significantly higher rates of A-RCs in people with BDD relative to healthy controls, they are not used any more so for more adaptive reasons. Rather, significant differences between these groups arise only when asking about the more unhelpful functions of A-RCs.

The present investigation also found that people with BDD had significantly stronger agreement in the beliefs that A-RCs are a means of self-loathing relative to healthy controls. Moreover, this finding suggests that people with BDD believe that A-RCs are a means through which they can confirm their own beliefs about being physically unattractive. Indeed of all the beliefs about the functions of A-RCs that were investigated the largest effect size ($r = -.79$) between people with BDD and healthy

controls was for the function of self-loathing. People with BDD therefore appear to firmly believe that A-RCs are a means of confirming that their physical appearance is unattractive/ugly or flawed. Indeed, it therefore makes sense that a disproportionately higher frequency of more upwards A-RCs (Cash's (1991, 2008) "unfair to compare") were found in people with BDD relative to healthy controls compared to the other directions of such comparing. That is, people are most likely to use a behaviour for a function in which they most firmly believe it to serve for them. People with BDD might therefore drive their preponderance of generally more upwards A-RCs owing to their belief that A-RCs serve a function of self-loathing.

The tendency for more upwards A-RCs in people with BDD might also occur because their beliefs about the function of self-loathing feed into a tendency for selecting the area of perceived defect in observations of unfamiliar faces (Grochowski et al., 2012). The resultant appraisal of more upwards A-RCs is likely to result in lower appearance self-evaluations, increased body dissatisfaction, and negative affect (O'Brien et al., 2009; Leahey et al., 2007; Engeln-Maddox, 2005; Bailey & Ricciardelli, 2010). The author proposes that increased body dissatisfaction and negative affect are subsequent to a secondary appraisal of lower self-evaluated physical attractiveness. The present investigation's results are in keeping with the cognitive-behavioural sequence described in this paragraph. A diagrammatic illustration of this sequence is therefore included to promote an understanding of how the results of the present investigation might fit together (see figure 4).

The present investigation's results also found that people with BDD were significantly less satisfied with their appearance after comparing relative to healthy controls and this is also in keeping with the diagrammatic illustration found in figure 4. The diagrammatic illustration also proposes a larger feedback loop where beliefs about the function of A-RCs as one of self-loathing are confirmed by the smaller feedback loop. In this smaller feedback loop the persistent pairing of what become perceived as more upwards A-RCs with lower self-evaluated physical attractiveness and negative affective outcomes, potentially through mechanisms of classical or evaluative conditioning, might lead to conditioned negative emotional responding to A-RCs more generally (Neziroglu et al., 2008). The negative affective outcomes of perceived upwards A-RCs in people with BDD might also feed back into an

interpretation of more upwards A-RCs. This is illustrated in the role of affective outcomes feeding back into the primary appraisal shown in figure 4. This process is proposed to be in keeping with evidence of a depression-linked negative interpretation bias which is substantial (e.g., Norman, Miller, & Klee, 1983; Nunn, Mathews, & Trower, 1997). More specifically, there is evidence to show that induced low mood can lead to more unfavourable body perception at least in female samples (Baker, Williamson, & Sylve, 1995; Taylor, & Cooper, 1992).

The present investigation also found that people with BDD had significantly stronger agreement in the beliefs that A-RCs are a means of threat management, through their use to initiate safety seeking behaviours/ checking or avoidance, relative to healthy controls. Such behaviours are known to maintain anxiety through the prevention of disconfirming feared outcomes (Salkovskis, 1991). The present findings therefore suggest that beliefs about A-RCs in people with BDD feed into the maintenance of the social-evaluative concerns that often come with this disorder (Pinto & Phillips, 2005; Coles et al., 2006; Anson, 2008).

4.6 Hypothesis 3: Investigating the self-serving A-RCs bias

4.6.1 Self-serving A-RCs

The experimental hypothesis (hypothesis 3) of the present investigation was not supported. The present results indicated that neither healthy controls nor people with BDD become significantly more self-serving in their evaluations of physical appearance when self-focused. Indeed this null result was found for both ratings of the general attractiveness of others and self-evaluated attractiveness compared to others. It is possible that this null interaction effect is owing to insufficient statistical power. Results hold implications for the information-processing cognitive behavioural models of BDD proposed by Veale (2004) and Veale & Nezirolgu (2010). These models assert that an appearance-related trigger can lead to S-FA on negatively appraised imagery which in turn leads to other maladaptive cognitive and behavioural processes. The models therefore give a central role to S-FA in linking appearance-related triggers and other BDD related phenomena.

Figure 4.

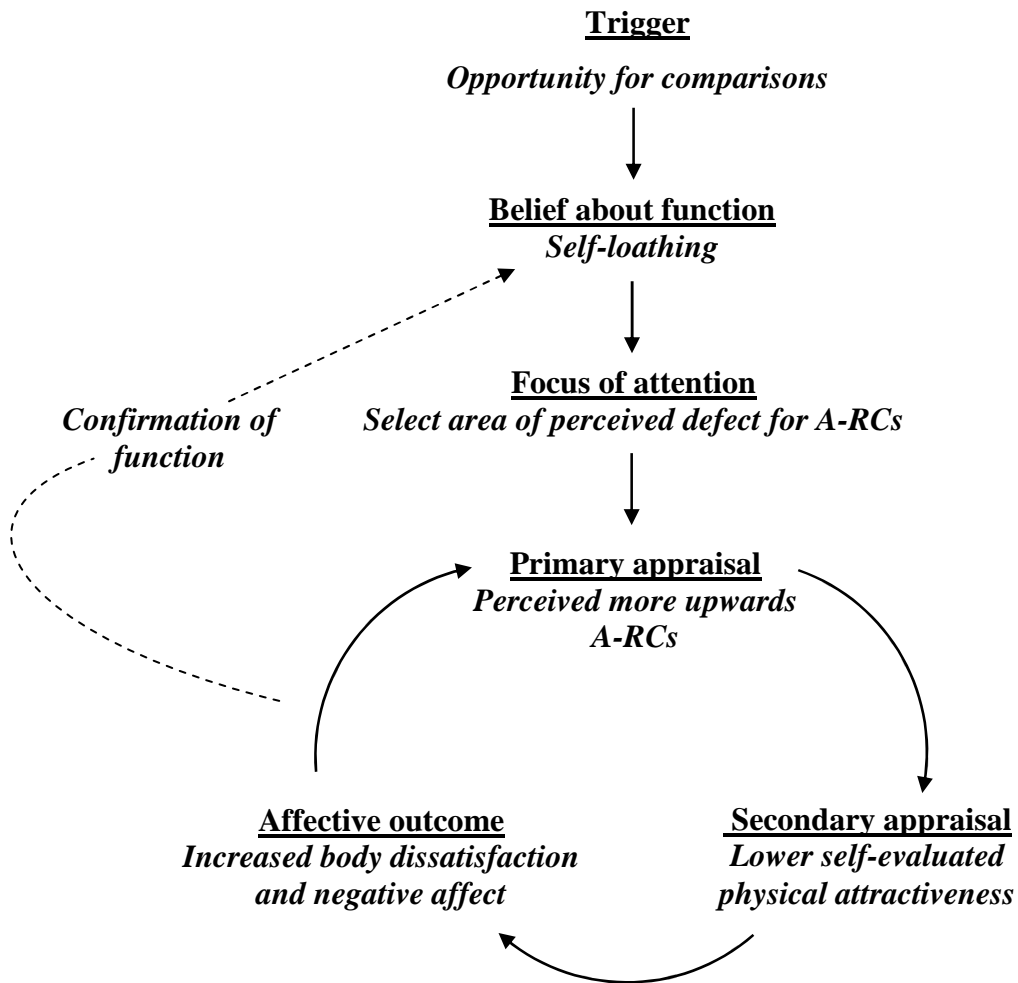


Figure 4. Reinforcement of self-loathing more upwards A-RCs in BDD.

The results of the present investigation suggest that S-FA at the implicit level of awareness might not be sufficient for driving differences in evaluations of A-RCs in people with BDD relative to healthy controls. That is, there was no difference in the processing of appearance-related comparison information between people with BDD and healthy controls contingent on implicit S-FA. A self-serving A-RCs bias contingent on S-FA was therefore not found.

A self-serving A-RCs bias contingent on S-FA was however found in Schwinghammer et al. (2006) - the study on which the present investigation's main hypothesis was partly based. The author proposes that the most adequate explanations for the present null effects can be derived by comparing the methods

and samples used in these respective investigations. The designs, for example, were different in the 2 studies. The Schwinghammer et al. (2006) study used a between subjects design whereas the present investigation used a mixed design with attention condition as a repeated measures variable. A mixed design was decided upon owing to time constraints and the difficulty in recruiting large enough numbers of people with BDD for a between subjects design.

The present investigation and the Schwinghammer et al. (2006) study differed in terms of a number of aspects of the experimental procedure. In the present investigation the main dependent variables were mean ratings taken from 3 photos in each attention condition. In Schwinghammer et al. (2006) dependent variables were from ratings taken from 1 photo. The present investigation however also carried out analyses of ratings that followed the first photos only, although again the null effect was still found. It might have been that the photos used in the present investigation were not sufficiently attractive in order to induce the self-serving A-RCs bias found in Schwinghammer et al. (2006) despite a purposeful selection of faces with high physical attractiveness (>5 out of 7). It is also worth noting that the interaction effects found in Schwinghammer et al. (2006) were between independent variables of SFA (S-FA vs. a control attention condition) and the attractiveness of the target of comparison (attractive vs. unattractive). It might be asserted that the use of portraits of differing levels of attractiveness is required for a self-serving A-RCs bias to be found. According to the Schwinghammer et al. (2006) data however, the use of attractive portraits alone should give a salient A-RCs bias contingent on implicit S-FA, hence their selection in the present investigation.

Another source of difference is the content of the dependent variables used. The first dependent variable (*the general attractiveness of others*) in the present investigation was ratings from: “rate the physical attractiveness of the person you have just seen”. This variable bares most resemblance to the Schwinghammer et al. (2006) study dependent variable (called: *Attractiveness comparison other*) which was ratings from: “In general, to what extent do you think this person is seen as attractive?”. These variables are considered very similar. The second dependent variable (*self-evaluated attractiveness compared to others*) in the present investigation was ratings from: “rate the physical attractiveness of the person you have just seen in comparison

to your own physical attractiveness”. This variable bears most resemblance to the Schwinghammer et al. (2006) study dependent variable (called: *Self-evaluation*) which was combined ratings from: “To what extent do you think you are attractive?” and “To what extent are you satisfied with your looks?” This dependent variable is therefore not explicitly about A-RCs, in addition to having an affective loading (i.e. a rating of body satisfaction), which was not an aspect of the present investigation’s dependent variable. Indeed it might be that the self-serving A-RCs bias found in the latter of the Schwinghammer et al. (2006) variables was contingent on its apparent focus on self-evaluated attractiveness (i.e. without the mention of an explicit appearance comparison) and/or its sensitivity to an induced affective state.

It is interesting that the manipulation check of the S-FA condition showed that there was a differential influence of the vignette task between people with BDD and healthy controls. Indeed there were a significant proportion of people with BDD with evidence suggesting that the manipulation of S-FA induced a more explicit focus of attention on the self, relative to healthy controls. One explanation of this differential influence is the content of the vignette used to induce S-FA which states “everywhere I go I see my reflection looking back at me in the glass of a hundred windows”. Indeed some people with BDD wrote in the manipulation check for the S-FA condition that they had had thoughts about their face/ an appearance concern, or their reflection. These reports are very understandable given that mirror checking and gazing are key clinical features of BDD that are also associated with increased S-FA (Phillips et al., 1993; Windheim et al., 2011).

A more theoretical explanation however which might account for the people with BDD who reported thoughts about their appearance (and hence evidence of explicit S-FA) without clear reference to reflections is related to more general differences between clinical populations and healthy controls in terms of S-FA. Woodruff et al. (2001) for example found that general measures of psychopathology and severity are correlated with S-FA, with these correlations becoming more pronounced when isolating negative S-FA. The vignette task might therefore have elicited more explicit S-FA in people with BDD relative to the healthy controls due to a more enduring trait vulnerability. The vignette task might also have resulted in S-FA at a higher level of awareness in people with BDD owing to a trait vulnerability independent of

the vignette's content. It would follow that these higher levels of S-FA would have a particularly self-relevant content. According to a cognitive-behavioural model of BDD the content brought to mind would likely be the distorted internal body image that it proposes exists in people with BDD hence their self-reports about physical appearance (Veale, 2004; Osman, et al., 2004).

The differential influence of the vignette (with the S-FA manipulation check reports of appearance occurring only in people with BDD) was not strong enough to drive a significant difference in the dependent variables however. This is interesting given that there is a suggestion that the more available or easily brought to mind information is the greater its impact on subsequent inferences is said to be (Tversky & Kahneman, 1973). Furthermore it has been consistently demonstrated that self-focus increases the influence of self-relevant and internal sources of information on subsequent judgments and behaviours (Duval & Wicklund, 1972; Pryor, Gibbons, Wicklund, Fazio, & Hood, 1977). If there is a self-serving A-RCs bias in healthy controls contingent on S-FA that is not found in people with BDD then it would seem that a different manipulation of S-FA and/or more statistical power to that used in the present investigation is required.

The author's intentions however were to test for a replication of the self-serving A-RCs bias found in healthy controls (found in Schwinghammer et al., 2006) and also to hypothesise a relative absence of this bias in people with BDD. It was therefore deemed experimentally sound to utilise the same manipulation of S-FA as in Schwinghammer et al. (2006) despite this being one at the implicit level of processing. Indeed more explicit inductions of S-FA might not give rise to a self-serving A-RCs bias perhaps due to its tendency to induce more negative affect (Mor & Winquist, 2002). Furthermore, the author wished to investigate an implicit process in BDD due to their being little research on this topic despite it being asserted that such processing can maintain anxiety pathology (Buhlmann et al., 2008; Buhlmann et al., 2009; Buhlmann et al., 2011; Beck & Clark, 1997; McNally, 1995).

The Schwinghammer et al. (2006) study used a sample of female students and although not explicitly stated in the study's methodology, it must be presumed that these students were of a fairly average undergraduate age i.e. approximately late

teens to early twenties. Healthy controls in the present investigation were matched approximately according to both age and sex to the group of people with BDD. In consequence their mean age was approximately 31 years and there were 50% males in the group. Differences in the results between the present investigation and the Schwinghammer et al. (2006) study might therefore be owing to an effect of age and/or sex both of which have been found to influence body image perception (Rusticus & Hubley, 2006). Furthermore S-FA has been found to have a stronger effect in females (Mor & Winqvist, 2002). It is acknowledged however that Mor & Winqvist (2002) were referring to the association between S-FA and negative affect whilst the dependent variables used in the present investigation were related to perceptions of attractiveness and therefore not directly affect laden.

Furthermore there might have been other characteristics inherent to the highly homogenous student sample of the Schwinghammer et al. (2006) study which drove their effect of an A-RCs bias contingent on S-FA (see Wintre, North & Sugar, 2001). In contrast to their student sample the healthy controls of the present investigation were varied in a range of demographic variables including employment status, marital status and level of education. The influence of demographic variables might have been responsible for why a replication of Schwinghammer et al. (2006) was not found. More statistical power may be needed to drive a replication of the Schwinghammer et al. (2006) findings in a more heterogeneous sample.

4.6.2 Experimental main effect of A-RCs

It is noteworthy that people with BDD rated their *self-evaluated attractiveness compared to others* (dependent variable 2) as significantly lower than healthy controls. There was no significant difference between groups for ratings of *the general attractiveness of others* (dependent variable 1) however. The juxtaposition of these findings is in keeping with the notion that body image problems in BDD are related to negative self-evaluations as opposed to excessively high physical appearance evaluations of others. Dependent variable 2 was therefore more sensitive to the psychopathology of BDD because it asked for A-RCs which explicitly incorporated self-evaluations. Dependent variable 1 however was focused on the evaluation of others' physical attractiveness. There is some evidence however that people with BDD form significantly higher evaluations of physical attractiveness in

attractive others relative to healthy controls (Buhlmann et al., 2008). The present findings are nonetheless in keeping with theories of body image disturbance proposing that appearance comparison is a core factor in the development and maintenance of distorted body image (e.g. Stormer and Thompson, 1996). The present findings are also in keeping with current diagnostic accounts of BDD as a disorder of perceived appearance flaws in the self (APA, 2000; Phillips et al., 2010). The above findings therefore contribute to the knowledge of BDD. Such contributions to empirical literature are still important because there is still limited knowledge of BDD amongst health professionals. Perhaps not mutually exclusive from this issue is that people with BDD can be very self-critical and experience their appearance concerns as “vain, superficial, narcissistic, or self-indulgent” leading to feelings of shame. Indeed research has shown that owing to such feelings people with BDD are unlikely to voice their appearance concerns unless specifically asked by their physician (Grant et al., 2001). Research contributing to the knowledge of BDD should contribute to mitigating feelings of shame by virtue of its application into the healthcare setting and wider public dissemination.

4.7 Hypothesis 4: Exploratory analyses on self-esteem in BDD

The present investigation found that people with BDD had significantly lower levels of self-esteem relative to healthy controls in keeping with other research (Bohne et al., 2002; Phillips et al., 2004). The present investigation also wished to explore a division in this construct, highlighting self-competence and self-liking, in people with BDD (Tafarodi & Swann, 1995; Tafarodi & Milne, 2002; Sinclair et al., 2010). It was hypothesised that self-liking would be disproportionately lower than self-competence in people with BDD relative to healthy controls. Contrary to hypothesis 4 however self-competence and self-liking were both significantly lower in people with BDD relative to healthy controls to a similar extent based on an observation of effect sizes.

It is interesting to consider however that self-competence and self-liking may or may not be adversely affected in people with BDD for different reasons. Self-liking for instance has been defined partly as the valuation of the self as an aesthetic social object (Tafarodi & Milne, 2002) which is a construct deemed relevant to BDD and hence further elaborated on in cognitive-behavioural models of this disorder (Veale,

2004; Neziroglu & Veale, 2010). Self-liking might therefore be affected mainly by a direct effect of BDD symptomatology. Furthermore self-liking has been found to be relatively low in single individuals and indeed as much as 75% of people with BDD have been found to be single (Sinclair et al., 2010; Phillips, McElory, Keck, Hudson, & Pope, 1994). Notwithstanding, the low levels of self-liking and self-competence found in people with BDD relative to healthy controls might well be a more general reflection of poor quality of life and poor psychosocial functioning (Phillips, 2000; Phillips et al., 2008).

4.8 Limitations

4.8.1 Absence of a clinical control group

The present investigation had no clinical control group as part of its design. It is therefore difficult to ascertain the extent to which group differences were driven by an effect of BDD symptomatology as opposed to discrepancies in levels of psychopathology per se. A stronger experimental design would therefore have included another group from a different clinical population to assist with ruling out such possibilities. Indeed it has been shown in experimental studies that clinical samples respond with higher levels of negative affect to S-FA manipulations as compared to in non-clinical samples (Mor & Winquist, 2002). More specifically, depression is an example of a disorder in which S-FA can have maladaptive consequences (Rimes & Watkins, 2005) as is purported to be the case in BDD (Veale, 2004). A group of clinically depressed participants might therefore have been a sound choice for a clinical control group. Furthermore, in keeping with the literature on co-morbidity in BDD a large proportion of the people with this disorder in the present investigation were clinically depressed (Gunstad & Phillips, 2003). The present investigation found that both healthy controls and people with BDD were characterised by the absence of a significant self-serving A-RCs in the context of using a manipulation of S-FA. The notion of an absent self-serving bias of any kind however, whether centred on appearance-comparisons or not, is in keeping with the notion of depressive realism (Ally & Abramson, 1979). It cannot be ascertained from the present investigation that the lack of a self-serving A-RCs bias in people with BDD was more generally a product of high levels of depression in the sample as opposed to it being due to distorted and negatively appraised imagery (Osman et al.,

2004). This conclusion stands irrespective of the lack of a self-serving A-RCs bias in the healthy controls. Statistical control for the influence of depression might have been one option in the present investigation. Researchers studying another disorder characterised by body dissatisfaction (Anorexia Nervosa) however have asserted that such statistical methods are not a valid option when depression is so inextricably linked to the disorder of main interest (Jansen et al., 2006). This point is therefore also applicable to hypothesis 2 of the present investigation in which a series of ANCOVAS were used to explore the specificity of A-RCs in people with BDD. The use of the ANCOVA to control for group differences in psychopathology is common yet a point of controversy in the field (Miller & Chapman, 2001).

Evidence has also suggested that people with depression are a clinical group particularly interested in making social comparisons, and negative social comparison and depression have been shown to be associated in a number of populations (Swallow & Kuiper, 1992; Gilbert, 2000; Gilbert et al., 2002; Troop et al. 2003). The link between depression and low self-esteem has also been well established (e.g. Battle, 1978). These findings again suggest that the present investigation would have benefited from a clinical control group of people with depression to explore the specificity of A-RCs in BDD. The findings were nonetheless suggestive of such specificity which could be built on with the suggested more comprehensive design.

4.8.2 Objective attractiveness

The present investigation matched people with BDD approximately on both age and sex to minimise any potential confound from these variables with those that the author was more interested in measuring. An interesting point to consider however is that the author made no attempt to match groups by objective ratings of physical attractiveness. Matching on such a variable would indeed be akin to accounting for more objective variables in studies of other disorders such as life events in depression or nature of trauma event in post-traumatic stress-disorder (e.g. Michael, Ehlers, & Halligan, 2005).

One study has shown that the physical appearance of healthy controls, people with BDD, and people on a waiting list for rhinoplasty was not significantly different in terms of attractiveness (Thomas & Goldberg, 1995). The BDD participants in the

Thomas & Goldberg (1995) study however were also found to have a variety of abnormal features as identified by a technique called morphanalysis which was deemed to be an objective measure of physical attractiveness. This study however used a small number of BDD participants ($n = 11$) of whom some had this as a secondary diagnosis. Some studies of body image disturbance focusing on BDD in particular are now starting to control for more objective physical appearance variables such as genital size in samples where this is also the body area of preoccupation and distress (Veale, *personal communication*). The present investigation's main hypothesis however was nonetheless focused on an interaction effect looking at a change in perception of physical attractiveness as a repeated-measures variable meaning that there was a within-group control for objective attractiveness. The limitation however does apply to the present investigation's main effects.

4.8.3 Ecological validity

The present investigation had a strong reliance on self-report data and its experimental design used 2-dimensional photographic portraits as appearance-related comparison information. Its methods could therefore be more ecologically valid. Indeed some research has used daily momentary assessments of A-RCs and associated affective reactions in both body satisfied and dissatisfied women (Leahey et al., 2007; Leahey & Crowther, 2008). Other research has also related S-FA measurements to real life negative social interactions (Flory et al., 2000). Compared to these pieces of research it can be asserted that the results of the present investigation cannot be as easily generalised to daily S-FA and A-RCs. Nonetheless people are exposed to images found in magazines/ on television regularly and this information can contribute to lower self-evaluated physical attractiveness and body dissatisfaction (Cash et al., 1983; Heinberg & Thompson, 1995; Grabe, Ward, & Hyde, 2008). The present investigation's use of 2-dimensional photographic portraits therefore holds some ecological validity.

4.9 Clinical implications

4.9.1 Facilitating change in A-RCs in CBT for BDD

The present investigation found that the nature of A-RCs were significantly different in people with BDD relative to healthy controls. People with BDD also reported significantly less favourable self-evaluations of physical attractiveness during A-RCs and reported being significantly less satisfied with their appearance after comparing relative to healthy controls. It follows that A-RCs are likely to at least partly maintain these aspects of body image disturbance in BDD. Clinical intervention should therefore encourage a reduction in this behaviour. In therapeutic discussion people with BDD might therefore be encouraged to reduce A-RCs with the rationale that this will reduce the uncertainty and ambiguity which is likely to be reinforcing a need to self-evaluate their physical attractiveness. Figure 2 of this discussion could be used to formulate this vicious cycle to illustrate the proposed rationale for reducing A-RCs. A discussion on the role of intermittent reinforcement in maintaining A-RCs as a form of self-evaluation (or self-loathing) might also assist in therapy.

In figure 4 of this discussion it was illustrated how beliefs about A-RCs as a means of self-loathing might feed into attention and interpretation biases. These biases then in turn lead to a cognitive-affective cycle reinforcing both perceived more upwards A-RCs and beliefs about A-RCs as serving a function of confirming physical unattractiveness/ self-loathing. The author proposes that this figure could also be useful in promoting a formulaic understanding of this vicious cycle. The author also proposes that Padesky's prejudice model would be useful in socialising people with BDD to the notion that their beliefs about A-RCs as a way to confirm physical unattractiveness (and perhaps their wider beliefs about self-evaluated unattractiveness) could be both self-fulfilling and indeed maintained through cognitive distortion (Padesky, 1993). The present findings also suggested that, in people with BDD, A-RCs can function to manage threat. The clinical implication here is that cognitive-behavioural therapists should ask about situations in which A-RCs are most often engaged with. Such questioning might then elicit further information on situations in which the safety seeking behaviours and avoidance strategies that are maintaining feared outcomes are being used (Salkovskis, 1991).

Evidence in the manipulation check of the S-FA condition of distressing appearance-related thoughts and imagery in people with BDD further corroborates a need for imagery work in CBT (Osman et al., 2004). Such imagery work should facilitate both an awareness and alteration of the vividly experienced distorted or disturbed content of S-FA in people with BDD to reduce the self-defeating point of reference in A-RCs. Furthermore, for people with BDD who often create A-RCs with media information, an effort to show how untrue to real life many such targets of comparison are should be made.

4.9.2 Mindfulness for A-RCs and S-FA in BDD

The present findings also hold implications for the use of therapeutic approaches that might more directly address the highly automatic process of engagement with A-RCs that was reported in people with BDD relative to healthy controls. Indeed this would seem important based on evidence that the habitual component of negative body image thinking about appearance predicts body dissatisfaction over and above the negative content of such thinking (Verplanken & Tangelder, 2011). Mindfulness meditation has been defined as “paying attention in a particular way, on purpose, in the present moment, and non-judgementally” (Kabat-Zinn, 1994). The nonreactive attention that it promotes might help people with BDD to notice urges for A-RCs without subsequent behavioural engagement with them (or rumination about/self-criticism for having such urges). Such intervention would bare relation to the use of mindfulness in other populations (Bowen & Marlatt, 2009). Mindfulness practice might therefore facilitate the ‘breaking’ of habitual responding through A-RCs in people with BDD. Promoting this way of being might alleviate the significantly lower self-evaluations of physical attractiveness and body dissatisfaction that A-RCs were found to be associated with relative to healthy controls. Indeed this would seem an important clinical implication when considering that the present findings also showed people with BDD engage in a higher frequency of A-RCs relative to healthy controls.

Pyszczynski & Greenberg (1987) proposed that when people become caught in attempting to reduce an irreducible discrepancy that they perceive between themselves and a particular standard, a depressive self-focusing style occurs where negative self-aspects are focused on resulting in depression. Based on the findings of

the present investigation it would therefore seem logical that A-RCs (as well as self-discrepancies between the perceived self and ideal self) could well constitute such irreducible discrepancies in people with BDD perhaps contributing to their vulnerability to depression (Veale et al., 2003; Lambrou et al., 2011; Gunstad & Phillips, 2003). This hypothesis is also corroborated by evidence that the relationship between social comparison and depression is moderated by the perceived importance of the topic of comparison when considering that people with BDD hold over-valued ideas about appearance (Thwaites & Dagnan, 2004; Veale, 2002).

Mindfulness meditation is said to promote changing a person's relationship with their experiences as they arise (Teasdale, 2002) and might therefore address the unhelpful impact that A-RCs (and other forms of appearance-related discrepancy-based processing) can have in people with BDD (Veale et al., 2003; Lambrou et al., 2011). Mindfulness meditation might also assist people with BDD to form a more adaptive form of S-FA to reduce appearance-related rumination as part of the more flexible attentional system which is advocated in BDD intervention work (Baer, 2009; Veale & Neziroglu, 2010).

4.10 Future directions for research

In terms of forming further directions for research, it is interesting to consider further why the manipulation of S-FA did not drive an interaction effect between people with BDD and healthy controls. The author asserts that the main experimental research question of the present investigation is worth more comprehensive empirical research in the context of both the possible presence or absence of both self-serving and self-loathing/self-defeating A-RCs biases in people with BDD. To form such future directions for research the author critically appraises the present investigation with reference to the cognitive-behavioural information-processing model of BDD and a recent multi-component model of aesthetic sensitivity (Veale, 2004; Veale & Neziroglu, 2010; Lambrou et al., 2011).

The manipulation used in the present investigation was designed to induce implicit S-FA. Irrespective of not finding an A-RCs bias in healthy controls it is proposed that the manipulation was not explicit enough to drive a significant reduction in

perceptions of physical attractiveness in the S-FA condition relative to the control attention condition in people with BDD. Moreover, Veale's (2004) cognitive-behavioural model proposes that, when triggered, S-FA is directed to a distorted and negatively appraised image of the self. A more explicit manipulation of S-FA might therefore be needed to trigger sufficient awareness of this imagery in order to drive the significant interaction effect which was hypothesised in the present investigation albeit characterised by a self-loathing/self-defeating A-RCs bias in people with BDD. It is again noted however that in a subset of people with BDD the manipulation of S-FA did have an effect at a more explicit level of awareness as indicated in the S-FA manipulation check. A more powerful manipulation of explicit S-FA nonetheless, which would also be highly related to BDD phenomenology, would be the use of mirror-gazing (Windheim et al., 2011). Other non-rumination studies of S-FA have used the presentation of a mirror (Mor & Winquist, 2002). A manipulation of appearance-related rumination which would influence both the content and form of S-FA might also be informative for future research on A-RCs biases in people with BDD given that rumination is also a key aspect of BDD phenomenology (Veale, 2004).

A more comprehensive investigation of A-RCs biases in people with BDD should also take into account the several components of aesthetic sensitivity when choosing its method of S-FA manipulation and when designing its dependent variables (Lambrou et al., 2011). Again a more explicit manipulation of S-FA might be needed in order to drive differences in perceptual sensitivity, emotional sensitivity or evaluative components of aesthetic sensitivity during A-RCs (Lambrou et al., 2011). The dependent variables chosen would need to be sensitive to the components of aesthetic sensitivity pertinent to such comparisons. For example, the present investigation's dependent variables were not of an affective content and so the experiment might not have tapped into an aspect of aesthetic sensitivity that would have otherwise driven an interaction effect between groups. A self-defeating A-RCs bias in people with BDD relative to healthy controls might be expected when manipulating S-FA or rumination while measuring aesthetic emotional sensitivity. Indeed rumination studies of S-FA tend to have a stronger influence on negative affect than non-rumination studies (Mor & Winquist, 2002). Other manipulations of S-FA that appear relatively more implicit as compared to ruminative ones, that still

yield strong effects in terms of their relationship with negative affect have included giving a speech, and listening to one's voice (Mor & Winquist, 2002). One of these manipulations might have given a more adequate test of the present investigation's main hypothesis testing for a self-serving A-RCs bias in healthy controls but not people with BDD contingent on S-FA.

In addition to looking for more adept ways of testing the main experimental research question of the present investigation there are other meaningful research questions that could be explored. In figure 4 the author presented a diagrammatic understanding of how the present investigation's findings might link together sequentially. In either people with BDD or analogue samples it would be clinically useful to know whether or not beliefs about the functions of A-RCs relate to the main area of appearance selected for A-RCs. Indeed, as proposed in figure 4, it might be that people who use A-RCs to serve a more unhelpful function of self-loathing (to confirm beliefs about physical unattractiveness) focus more on the area of their own appearance that they find the most disturbing when viewing targets of A-RCs. Furthermore, in an experimental design in which the area of focus in A-RCs is manipulated, either to include or exclude participants' most disturbing feature, it might be that this significantly influences the appraisal of the direction of appearance comparison, self-evaluated physical attractiveness, and resulting affective outcomes. Finally, those who focus more on A-RCs as serving a function of self-enhancement might focus their attention on the facial feature which they are most comfortable or happy with in their own appearance when viewing targets of A-RCs. This research would again start to approach the topic of self-serving biases in A-RCs similar to in the present investigation but with a more fine grained analysis.

4.11 Conclusion

In conclusion, the present investigation studied self-focused attention (S-FA) and appearance-related comparisons (A-RCs) in people with BDD. Questionnaire results supported hypotheses 1 and 2 regarding the nature and specificity of A-RCs in people with BDD, respectively. Indeed A-RCs were found to be significantly more frequent (for both specific features of concern and overall appearance), generally more upwards, and more automatic, relative to healthy controls. In keeping with

hypothesis 2 the more frequent A-RCs in people with BDD could not be attributed to the more general constructs relating to comparing that were controlled for. The author therefore found evidence for the specificity of A-RCs in BDD hence supporting their inclusion in cognitive-behavioural models of this disorder (Veale, 2004; Veale & Neziroglu, 2010).

Using a newly developed questionnaire, some beliefs about A-RCs were also explored in people with BDD. Results suggested that people with BDD, relative to healthy controls, held significantly stronger agreement with beliefs about A-RCs as a means of self-evaluation, self-loathing (a way to confirm beliefs about physical unattractiveness) and as a means of threat management.

The present investigation however did not find evidence to suggest that healthy controls but not people with BDD hold a self-serving A-RCs bias contingent on S-FA. Hypothesis 3 was therefore not supported. Results nonetheless informed Veale's (2004) and Veale and Neziroglu's (2010) information-processing cognitive-behavioural models of BDD. The models outline S-FA as key to linking appearance-related triggers with negatively appraised imagery and subsequent maladaptive cognitive and behavioural processes. Results suggest that S-FA at the implicit level of awareness might not be sufficient for driving differences in evaluations of physical appearance in people with BDD relative to healthy controls.

Hypothesis 4 of the present investigation was tested using exploratory analyses on self-esteem in BDD. Hypothesis 4 was based on research proposing divisions of self-esteem with self-liking appearing to bare more relation to cognitive-behavioural models of this disorder relative to self-competence (Tafarodi & Milne, 2002, Veale, 2004; Veale & Neziroglu, 2010). Contrary to hypothesis 4 however self-competence and self-liking were both significantly lower in people with BDD relative to healthy controls to a similar extent.

The discussion of limitations of the present investigation was focused on the absence of a clinical control group, the measurement of objective attractiveness, and the research's ecological validity. Clinical implications about how to guide cognitive-behavioural therapy were made by integrating present findings with other empirical

evidence in the development of two brief models of A-RCs in BDD. Results showing that people with BDD, relative to healthy controls, hold beliefs about A-RCs as a means of threat management hold implications for eliciting information on SSBs and avoidance in therapy. The application of mindfulness to both A-RCs and S-FA in people with BDD was also suggested.

The future directions for research section covered further methods of testing the main experimental hypothesis in a more comprehensive investigation of S-FA and self-serving as well as self-loathing/self-defeating A-RCs biases in BDD. These future directions were informed by the cognitive-behavioural information-processing model of BDD and a recent multi-component model of aesthetic sensitivity (Veale, 2004; Veale & Neziroglu, 2010; Lambrou et al., 2011). In this context both different manipulations of S-FA and dependent variables were considered.

Cognitive-behavioural models of BDD and therapy for this disorder should incorporate the present investigation's findings relating to S-FA and A-RCs. The author has offered guidance on how this might best be advanced. The author also asserts that the suggested future research would be fruitful for further understanding and treating the disorder.

5.0 References

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6.0 Appendices

6.1 Appendix 1: Figures from Schwinghammer et al. (2006)

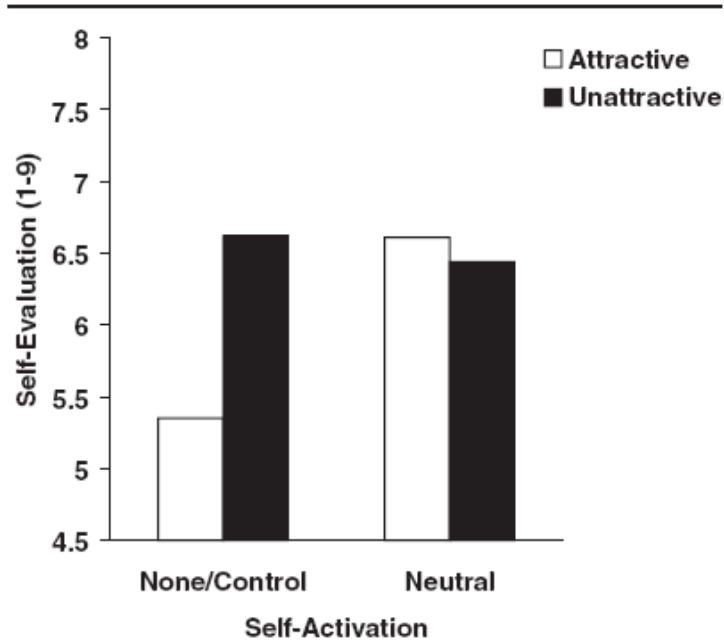


Figure 1 Self-evaluations of attractiveness as a function of self-activation and comparison: Study 1.

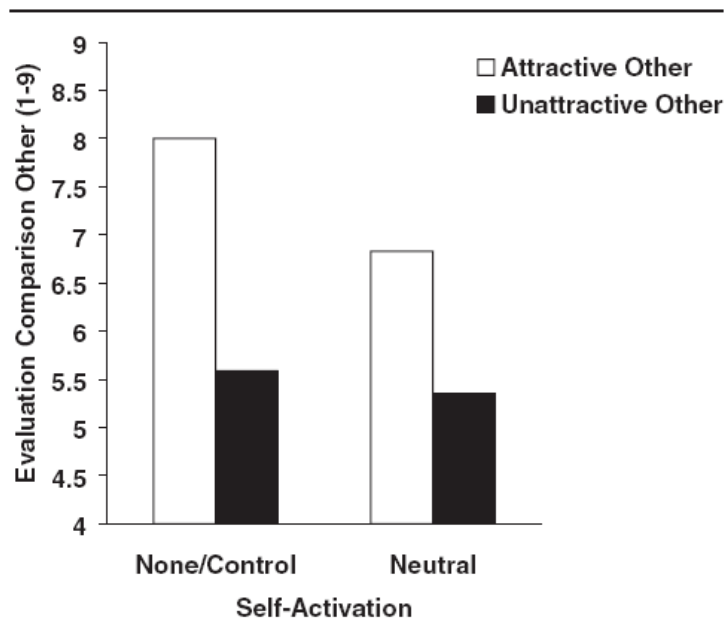


Figure 2 Evaluations of attractiveness of the comparison other as a function of self-activation and comparison: Study 1.

6.2 Appendix 2: Healthy controls circular e-mail to KCL Staff

Email subject line: Body Image Study: Request for Non-Academic/Non-Research/Non-Clinical Staff to take part as healthy volunteers – Circular

Circular email for use for the recruitment of volunteers for study 11/LO/0287 approved by the National Research Ethics Service Committee London – Camberwell St Giles. This project contributes to the College's role in conducting research, and teaching research methods. You are under no obligation to reply to this e-mail. However, if you choose to reply, participation in this research is voluntary and you may withdraw at any time.

We would like to invite you to take part in the above-named research study for. We are looking for male and female volunteers between 35 and 50 years old who do not have a current mental health problem, personality disorder or difficulties with substance abuse and who do not have any past history of a severe mental health condition or substance abuse. Volunteers should not have significant worries or anxieties about their physical appearance. We are also hoping to exclude academic, research and clinical staff.

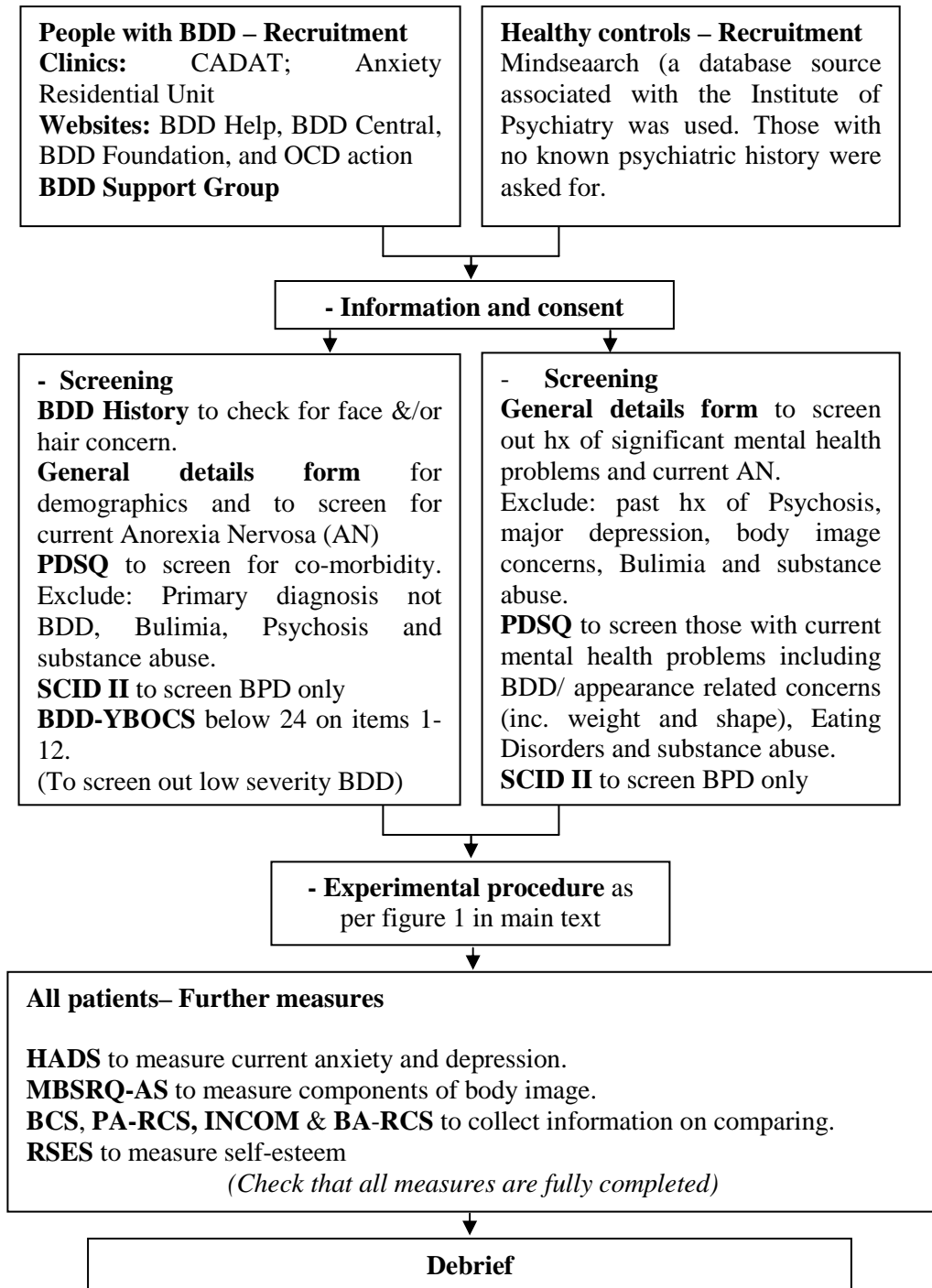
The purpose of the study is to learn more about the thoughts and behaviours related to comparing appearances in people with and without Body Dysmorphic Disorder (BDD). People with BDD are preoccupied with and distressed by one or more aspects of their physical appearance. More information can be provided if you decide to ring the Chief Investigator. We hope this research will inform treatments for BDD. The study is a student project being undertaken as part of a Doctorate in Clinical Psychology.

Taking part involves one phone interview of 15 minutes and one 45 minute meeting (max) with the study Chief Investigator, Mr Mark Turner, at the Addiction Sciences Building, 4 Windsor Walk, London SE5 8AF. If you decide to take part, you will be asked to complete some questionnaires and to look at some pictures of faces and answer questions about them. There will be questions about your current and past mental health and how you think and feel about your appearance and that of others. All information collected about you during the course of the research will be kept strictly confidential, and you will not be identifiable in any publications derived from the study. Should you decide to participate in this study you will receive £15 compensation for your time

If you are interested in participating, or would like further information, please contact the study Chief Investigator, Mr. Mark Turner, by replying by e mail to mark.turner@kcl.ac.uk, or by telephoning him on 07826 556 532.

Thank you.

6.3 Appendix 3: Recruitment and testing flow chart



6.4 Appendix 4: Participant information sheets and consent forms

Institute of Psychiatry
Department of Psychology
De Crespigny Park
Denmark Hill
SE5 8AF

**Institute of
Psychiatry**

at The Maudsley

Participant Information Sheet **for people with Body Dysmorphic Disorder**

Faces and comparing your appearance to other people

We would like to invite you to take part in a research project that forms part of a Doctorate in Clinical Psychology qualification. This document is designed to give you some information about the study, detailing what we hope to achieve, why we believe the research is important, and what your involvement, should you wish to take part, would entail. You are welcome to take your time in coming to a decision, and please do not hesitate to contact us with any queries, or to request further information.

What is the Purpose of Our Study?

We are conducting this study so that we can learn more about what maintains the difficulties that people with Body Dysmorphic Disorder (BDD) experience. More specifically, we hope to explore a possible maintenance mechanism in Body Dysmorphic Disorder (BDD) involving the thoughts and behaviours related to comparing appearance to other people. The research will therefore inform the way we understand BDD and the way we treat it using talk therapies such as Cognitive Behavioural Therapy.

Why Have I Been Chosen?

You have been chosen/ or responded to an advert asking for people to volunteer because you have a diagnosis of BDD, have face and/or hair related concerns, and because you are interested.

Do I Have to Take Part?

No. It is entirely up to you if you take part. This sheet is just some information about the study and it does not hold you to anything. We would also like to make it clear that should you choose not to be involved, this decision will not influence any treatment you may or may not be receiving now or in the future.

What Will Happen to Me if I Take Part?

At your initial meeting with the trainee clinical psychologist conducting the research you will be asked to read this information sheet and sign a consent form if you wish to take part. You would then take part in a screening procedure. This is described below.

Screening Procedure

The screening procedure would involve completing 5 questionnaires/interviews which should take around 40 minutes.

Completing your Participation

Straight after screening you would then complete the rest of the procedure. This would include a small amount of reading and looking at some pictures of faces, developing an impression of them, and completing some questions about them and your own appearance. This part of the procedure will not take long. Following this you would be asked to complete a final set of 7 questionnaires which should take around 30 minutes. We will then tell you more about the study and ask to write on a brief evaluation form. Information about compensation for your involvement is detailed below.

Compensation for Participation and Expenses

You will be compensated for your time by receiving £10. You are also entitled to claim back travel expenses if you have a receipt.

What Are the Possible Disadvantages, Risks or Side-Effects of Taking Part?

As outlined above, if you do wish to take part, we would be asking you to look at some pictures of faces and then answer some questions about them and your own appearance. If you started to experience feelings of discomfort or distress, you are free to withdraw as described above. You are also welcome to contact the Chief Investigator (Mr. Mark Turner) or the supervisors (Dr. David Veale and Dr. Martin Anson) to discuss these issues further, if you wish.

What Are the Possible Benefits of Taking Part?

We are not offering a form of treatment in the study although we hope that participants who choose to take part find the experience interesting. Participants can also take part knowing that they are contributing to research which aims to inform psychological treatment. As stated above you will also be compensated for your time by receiving £10.

What Will Happen if I Do Not Want to Carry On With The Study?

If you do choose to take part, but then change your mind during the process, you are free to withdraw at any point and without giving a reason. In this event, any information that you may already have provided will not be used, unless your

consent has been given. You would still be compensated for your participation with £10.

What if there is a Problem?

If at any point during your involvement in the study you experience concerns about aspects of our study you are welcome to contact the researchers, Mr. Mark Turner, Dr. Martin Anson and Dr. David Veale. If you remain dissatisfied and wish to make a formal complaint, this can be done through the NHS Complaints Procedure (please see contact details below).

Compensation for harm arising from accidental injury as a result of your participation in our research will be covered by the Institute of Psychiatry, Kings College London.

Will my Taking Part in the Study be Kept Confidential?

All data collected during the course of our research will be kept strictly confidential, and any information you provide will have your name and other personal details removed so that no individual can be recognised. All questionnaires will be stored in a locked filing cabinet accessible only to the researchers.

What Will Happen to the Data Collected For this Study?

The anonymous data will be analysed at the Institute of Psychiatry, Kings College London. The questionnaire data will be analysed using computer software and kept in a database for around 10 months.

What Will Happen to the Results of this Study?

The research project should be completed by March/April 2012, and if possible our findings will be published. If you choose to take part, you are very welcome to have a written summary of the final report. No individual's questionnaire responses or experiment findings will be published, and no individual will be identifiable.

Who Has Reviewed the Study?

The study protocol has been produced by the Chief Investigator along with his educational supervisors. This was then approved by the Chief Investigator's doctorate course organising core team. This study is also in receipt of ethical approval from the National Research Ethics Service (NRES) Committee London-Camberwell St Giles.

Contact Details

Chief Investigator

Mr. Mark Turner, Trainee Clinical Psychologist, Institute of Psychiatry, Kings College London, Addiction Sciences Building, 4 Windsor Walk, Denmark Hill, London SE5 8AF. Telephone: 07826556532

First and Second Educational Supervisors

Dr. Martin Anson, Cognitive behavioural therapist/clinical psychologist, Centre for Anxiety Disorders and Trauma (CADAT), Maudsley Hospital, 99 Denmark Hill, London, SE5 8AZ.

Telephone: 02032282431

Dr. David Veale, Consultant Psychiatrist, Centre for Anxiety Disorders and Trauma (CADAT), Maudsley Hospital, 99 Denmark Hill, London, SE5 8AZ.

Telephone: 020 3228 3286

South London and Maudsley NHS Trust Complaints Office

Maudsley Hospital, 111 Denmark Hill, London, SE5 8AZ. Telephone: 02032282444/2499

We wish to thank you for taking the time to read this information sheet, and if you have any queries please do not hesitate to contact us.

Participant Consent Form
for people with Body Dysmorphic Disorder

Research Project: Faces and comparing your appearance to other people

Chief Investigator:

Mr. Mark Turner (Trainee Clinical Psychologist, Institute of Psychiatry)

Educational Supervisors:

Dr. Martin Anson (Cognitive Behavioural Therapist/ Clinical Psychologist)

Dr. David Veale (Consultant Psychiatrist)

Please read the following statements and then initial the box on the right.

- | | |
|--|--------------------------|
| 1. I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information and ask questions. | <input type="checkbox"/> |
| 2. I also confirm that the researcher has explained the project and has answered my questions honestly and fully. | <input type="checkbox"/> |
| 3. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected. | <input type="checkbox"/> |
| 4. I understand that relevant sections of my medical notes (e.g. information on diagnosis) and data collected during the study may be looked at by the named researchers from the Institute of Psychiatry where this is relevant to my taking part in this research. I give permission for these individuals to have access to my records. | <input type="checkbox"/> |
| 5. I agree to take part in the above study. | <input type="checkbox"/> |

Name of Participant:

Date:

Signed:

.....

.....

Name of Person Taking Consent:

Date:

Signed:

.....

.....

Participant Information Sheet
For healthy control participants

Faces and comparing your appearance to other people

We would like to invite you to take part in a research project that forms part of a Doctorate in Clinical Psychology qualification. This document is designed to give you some information about the study, detailing what we hope to achieve, why we believe the research is important, and what your involvement, should you wish to take part, would entail. You are welcome to take your time in coming to a decision, and please do not hesitate to contact us with any queries, or to request further information.

What is the Purpose of Our Study?

We are conducting this study so that we can learn more about what maintains the difficulties that people with Body Dysmorphic Disorder (BDD) experience. More specifically, we hope to explore a possible maintenance mechanism in Body Dysmorphic Disorder (BDD) involving the thoughts and behaviours related to comparing appearance to other people. The research will therefore inform the way we understand BDD and the way we treat it using talk therapies such as Cognitive Behavioural Therapy.

Why Have I Been Chosen?

You have responded to an email advert asking for people to volunteer because you *do not* have a diagnosis of BDD and you are interested in helping with the research. We would like people without BDD to take part so that we have a point of comparison to our participants that do have this diagnosis.

Do I Have to Take Part?

No. It is entirely up to you if you take part. This sheet is just some information about the study and it does not hold you to anything. We would also like to make it clear that should you choose not to be involved, this decision will not influence any treatment you may or may not be receiving now or in the future.

What Will Happen to Me if I Take Part?

At your initial meeting with the trainee clinical psychologist conducting the research you will be asked to read this information sheet and sign a consent form if you wish to take part. You would then take part in a screening procedure. This is described below.

Screening Procedure

The screening procedure would involve completing 3 questionnaires/interviews which should take around 30 minutes.

Completing your Participation

Straight after screening you would then complete the rest of the procedure. This would include a small amount of reading and looking at some pictures of faces, developing an impression of them, and completing some questions about them and your own appearance. This part of the procedure will not take long. Following this you would be asked to complete a final set of 7 questionnaires which should take around 30 minutes. We will then tell you more about the study and ask to write on a brief evaluation form. Information about compensation for your involvement is detailed below.

Compensation for Participation and Expenses

You will be compensated for your time by receiving £10. You are also entitled to claim back travel expenses if you have a receipt.

What Are the Possible Disadvantages, Risks or Side-Effects of Taking Part?

As outlined above, if you do wish to take part, we would be asking you to look at some pictures of faces and then answer some questions about them and your own appearance. If you started to experience feelings of discomfort or distress, you are free to withdraw as described above. You are also welcome to contact the Chief Investigator (Mr. Mark Turner) or the supervisors (Dr. David Veale and Dr. Martin Anson) to discuss these issues further, if you wish.

What Are the Possible Benefits of Taking Part?

We are not offering a form of treatment in the study although we hope that participants who choose to take part find the experience interesting. Participants can also take part knowing that they are contributing to research which aims to inform psychological treatment. As stated above you will also be compensated for your time by receiving £10.

What Will Happen if I Do Not Want to Carry On With The Study?

If you do choose to take part, but then change your mind during the process, you are free to withdraw at any point and without giving a reason. In this event, any information that you may already have provided will not be used, unless your

consent has been given. You would still be compensated for your participation with £10.

What if there is a Problem?

If at any point during your involvement in the study you experience concerns about aspects of our study you are welcome to contact the researchers, Mr. Mark Turner, Dr. Martin Anson and Dr. David Veale. If you remain dissatisfied and wish to make a formal complaint, this can be done through the NHS Complaints Procedure (please see contact details below). Compensation for harm arising from accidental injury as a result of your participation in our research will be covered by the Institute of Psychiatry, Kings College London.

Will my Taking Part in the Study be Kept Confidential?

All data collected during the course of our research will be kept strictly confidential, and any information you provide will have your name and other personal details removed so that no individual can be recognised. All questionnaires will be stored in a locked filing cabinet accessible only to the researchers.

What Will Happen to the Data Collected For this Study?

The anonymous data will be analysed at the Institute of Psychiatry, Kings College London. The questionnaire data will be analysed using computer software and kept in a database for around 10 months.

What Will Happen to the Results of this Study?

The research project should be completed by March/April 2012, and if possible our findings will be published. If you choose to take part, you are very welcome to have a written summary of the final report. No individual's questionnaire responses or experiment findings will be published, and no individual will be identifiable.

Who Has Reviewed the Study?

The study protocol has been produced by the Chief Investigator along with his educational supervisors. This was then approved by the Chief Investigator's doctorate course organising core team. This study is also in receipt of ethical approval from the National Research Ethics Service (NRES) Committee London-Camberwell St Giles.

Contact Details

Chief Investigator

Mr. Mark Turner, Trainee Clinical Psychologist, Institute of Psychiatry, Kings College London, Addiction Sciences Building, 4 Windsor Walk, Denmark Hill, London SE5 8AF. Telephone: 07826556532

First and Second Educational Supervisors

Dr. Martin Anson, Cognitive behavioural therapist/clinical psychologist, Centre for Anxiety Disorders and Trauma (CADAT), Maudsley Hospital, 99 Denmark Hill, London, SE5 8AZ.

Telephone: 02032282431

Dr. David Veale, Consultant Psychiatrist, Centre for Anxiety Disorders and Trauma (CADAT), Maudsley Hospital, 99 Denmark Hill, London, SE5 8AZ.

Telephone: 020 3228 3286

South London and Maudsley NHS Trust Complaints Office

Maudsley Hospital, 111 Denmark Hill, London, SE5 8AZ. Telephone: 02032282444/2499

We wish to thank you for taking the time to read this information sheet, and if you have any queries please do not hesitate to contact us.

Institute of Psychiatry
Department of Psychology
De Crespigny Park
Denmark Hill
SE5 8AF

**Institute of
Psychiatry**

at The Maudsley

Participant Consent Form
For healthy control participants

Research Project: Faces and comparing your appearance to other people

Chief Investigator:

Mr. Mark Turner (Trainee Clinical Psychologist, Institute of Psychiatry)

Educational Supervisors:

Dr. Martin Anson (Cognitive Behavioural Therapist/ Clinical Psychologist)

Dr. David Veale (Consultant Psychiatrist)

Please read the following statements and then initial the box on the right.

- | | |
|--|--------------------------|
| 6. I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information and ask questions. | <input type="checkbox"/> |
| 7. I also confirm that the researcher has explained the project and has answered my questions honestly and fully. | <input type="checkbox"/> |
| 8. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected. | <input type="checkbox"/> |
| 9. I agree to take part in the above study. | <input type="checkbox"/> |

Name of Participant:

Date:

Signed:

.....

.....

Name of Person Taking Consent:

Date:

Signed:

.....

.....

6.5 Appendix 5: Psychometric properties of measures

Psychiatric Disorders Screening Questionnaire (PDSQ)

In a large sample of psychiatric outpatients the thirteen subscales of the PDSQ had good to excellent levels of internal consistency, test-retest reliability, and discriminant, convergent, and concurrent validity (Zimmerman & Mattia, 2001a). Again in a large sample of psychiatric outpatients the PDSQ was shown to have indices of predictive accuracy, namely sensitivity and negative predictive values, allowing the accurate identification of most cases and noncases, respectively (Zimmerman & Mattia, 2001b).

Body Dysmorphic Disorder Questionnaire (BDDQ)

The BDDQ was shown to have a sensitivity of 100% and a specificity of 89% in 66 adults in a psychiatric outpatient setting (Phillips, Atala, & Pope, 1995). Grant et al., (2001) also found the BDDQ to have a sensitivity of 100% and a specificity of 92.5% in 101 adults and 21 adolescents in a psychiatric inpatient sample. In addition, Phillips (1996a) reported that there is excellent agreement between the BDDQ and a clinician's judgement of whether BDD is present in assessments using the BDD DSM-IV diagnostic module. There is however a lack of reliability and validity data for this measure.

Structured clinical interview for DSM-IV axis II personality disorders (SCID II; version 2.0) (Borderline Personality Disorder (BPD) section only)

Maffei et al. (1997) studied the inter-rater reliability and internal consistency of the SCID-II 2.0 in 231 inpatients and outpatients. The categorical assessment of BPD was found to have an excellent inter-rater reliability coefficient of .909 (Cohen κ). Inter-rater reliability was not influenced by inpatient/ outpatient status or the presence/absence of an Axis I diagnosis. An excellent internal consistency coefficient was also found for the BPD section (interviewer θ = .86, Armor, 1974; observer θ = .85).

Yale-Brown Obsessive Compulsive Scale for Body Dysmorphic Disorder (BDD-YBOCS)

The BDD-YBOCS has been reported to have adequate inter-rater reliability (with intra-class correlation coefficients ranging from .79- 1.0 for the different items, and .99 for the total scale, good test-retest reliability over a period of one week ($r = .88$), and good internal consistency. The scale has also been shown to correlate with a measure of global severity, but not with a measure of general psychopathology, demonstrating its convergent and discriminant validity, respectively (Phillips et al., 1997). The internal consistency in the current sample was Cronbach's $\alpha = .7$.

Hospital Anxiety and Depression Scale (HADS)

The HADS has been shown to have acceptable reliability in a large non-clinical sample broadly representing that of the UK general adult population (Crawford, Henry, Crombie & Taylor, 2001).

Multidimensional Body-Self Relations Questionnaire – Appearance Scales (MBSRQ-AS)

Adequate psychometric properties have been found with various samples for these subscales (Brown, Cash, & Mikulka, 1990). The AE subscale, for example, has been found to have good test re-test reliability ($r = .90$), internal consistency ($\alpha = .86$), and forms of validity (Cash, 1994). The subscales have been found to have acceptable levels of internal consistency and test-retest reliability, and the full scale has demonstrated high levels of convergent, discriminant and construct validity (Cash, 2000; Cash, Counts, Hangen & Huffine, 1989). The reliability and validity of the BASS has also been shown to be no different to a revised version of the subscale with items differentially weighted for importance justifying the use of the original version (Giovannelli, Cash, Henson, & Engle (2008).

Body Comparison Scale (BCS)

The scale was found to have good internal consistency (Fisher and Thompson, 1998). The internal consistency in the current sample was Cronbach's $\alpha = .91$.

Physical Appearance-Related Comparison Scale (PA-RCS)

Items one, two, three and four of the PA-RCS were found to correlate significantly with the BCS giving an indication of adequate concurrent validity for these items ($r = .61, p = .000$, 2-sided; $r = .55, p < .001$, 2-sided; $r = .49, p = .001$, 2-sided; $r = .43, p = .004$, 2-sided, respectively).

Iowa-Netherlands Comparison Orientation Measure (INCOM)

The INCOM was validated in twenty-two samples of mainly students and adults from the United States and Netherlands. Confirmatory factor analysis showed that a single factor was viable but that two distinguishable factors with their items relating, approximately, to the distinction between abilities and opinions was most appropriate. The two factors correlated highly (.79). The scale showed good internal consistency across samples (Cronbach's $\alpha = .78-.85$). Correlations for stability over time ranged from .60 to .75 for variations durations. The scale's construct validity was confirmed as was concurrent validity, with correlations with both trait and state measures, and discriminant validity. Several studies also confirmed the scale's criterion related validity (see Gibbons & Buunk, 1999).

Rosenberg Self-Esteem Scale (RSES)

There is recent evidence supporting the scale's item convergent ($r = 0.57-0.79$) and discriminant validity ($r = 0.27-0.52$) and its internal consistency reliability ($\alpha = .91$) in a large sample of US adults (Sinclair et al., 2010). The RSES has been shown to be sensitive to change in a BDD treatment study (Rosen et al., 1995).

Using confirmatory factor analyses the assessment-acceptance division (and therefore the self-competence and self-liking division) of the RSES was shown to have discriminant validity. This interpretation was based on the better statistical fit of this two-dimensional model as compared to the RSES unidimensional model (Tafarodi & Milne, 2002).

To demonstrate clinical validity, Sinclair et al. (2010) showed that the RSES was significantly negatively correlated with depression ($r = -0.62, p < .001$) and anxiety ($r = -0.47, p < .001$). These authors also showed that both self-competence and self-

liking were negatively correlated with depression ($r = -0.52$, $p < .001$; $r = -0.63$, $p < .001$, respectively) and anxiety ($r = -0.42$, $p < .001$; $r = -0.45$, $p < .001$, respectively).

6.6 Appendix 6: General details forms



GENERAL DETAILS FORM **(for BDD participants)**

For study on **Faces and comparing your appearance to other people**

Name: _____

E-mail: _____

Telephone Number(s)
where you would be
happy for us to contact you:

Daytime: _____

Evening: _____

Mobile: _____

(Please turn over)

GENERAL DETAILS (Cont'd)

1. What is your sex?
 1. Male
 2. Female
2. What is your age (in years and months)?
3. What is your marital status? (Please tick)
 1. Single
 2. Married
 3. Cohabiting/Living together
 4. Separated/Divorced
 5. Other
4. What is your ethnic group? (Please tick)
 1. White (European / Anglo-American)
 2. Black - Caribbean
 3. Black - African
 4. South Asian (Indian / Pakistani / Bangladeshi / Sri Lankan)
 5. East Asian (Chinese / Japanese / Korean / Burmese / Vietnamese)
 6. Hispanic (South American / Mexican)
 7. Other
5. What is your education? (Please tick)
 1. Primary
 2. Secondary
 3. O-levels / GCSE's
 4. A-levels (or equivalents e.g. BTEC Nationals, NVQ advanced)
 5. Tertiary (Teaching / HND / Nursing)
 6. Tertiary (Degree level)
 7. Postgraduate (M.A., PhD., M.D. etc.)
 8. Other
6. What is your occupation?

(Please turn over)

SCREENING OF EATING BEHAVIOURS

7. During the past two weeks have you gone through a period where you ate very little to an extent where family or friends were worried about you?

1. Yes
2. No



GENERAL DETAILS FORM
(for healthy controls)

For study on Faces and comparing your appearance to other people

Name: _____

E-mail: _____

Telephone Number(s)
where you would be
happy for us to contact you:

Daytime: _____

Evening: _____

Mobile: _____

(Please turn over)

GENERAL DETAILS (Cont'd)

1. What is your sex?
 1. Male
 2. Female

2. What is your age (in years and months)?

3. What is your marital status? (Please tick)
 1. Single
 2. Married
 3. Cohabiting/Living together
 4. Separated/Divorced
 5. Other

4. What is your ethnic group? (Please tick)
 1. White (European / Anglo-American)
 2. Black - Caribbean
 3. Black - African
 4. South Asian (Indian / Pakistani / Bangladeshi / Sri Lankan)
 5. East Asian (Chinese / Japanese / Korean / Burmese / Vietnamese)
 6. Hispanic (South American / Mexican)
 7. Other

5. What is your education? (Please tick)
 1. Primary
 2. Secondary
 3. O-levels / GCSE's
 4. A-levels (or equivalents e.g. BTEC Nationals, NVQ advanced)
 5. Tertiary (Teaching / HND / Nursing)
 6. Tertiary (Degree level)
 7. Postgraduate (M.A., PhD., M.D. etc.)
 8. Other

6. What is your occupation?

(Please turn over)

SCREENING OF MENTAL HEALTH HISTORY

7. At any time during the past have you ever been convinced that people were watching, spying, or talking about you, or plotting against you? AND/OR At any time during the past have you thought that you had special powers or think that an outside force was controlling you? AND/OR At any time during the past have you heard voices or seen things that others were not seeing?

1. Yes
2. No

8. At any time during the past have you gone through a period of being significantly sad or depressed during which you had frequent thoughts of taking your life? AND at that time did you have difficulties with sleeping, appetite and concentration?

1. Yes
2. No

9. At any time during the past have you gone through a period of eating binges where you could not control how much you would eat AND/OR gone through a period where you ate very little to an extent where family or friends were worried about you?

1. Yes
2. No

10. At any time during the past have you gone through a period of worrying about the way you look (for at least an hour a day) to a point of significant distress effecting your friendships, relationships, study or work?

1. Yes
2. No

11. At any time during the past have you gone through a period of drinking too much alcohol or taking drugs to the point where you or others (such as family, friends or your doctor) thought that you had an alcohol or recreational/ illicit drug problem?

1. Yes
2. No

SCREENING OF EATING BEHAVIOURS

1. During the past two weeks have you gone through a period where you ate very little to an extent where family or friends were worried about you?

1. Yes
2. No

6.7 Appendix 7: Physical Appearance-Related Comparisons Scale

PA-RCS

Initials and participant number: _____

Date: _____

INSTRUCTIONS PAGES

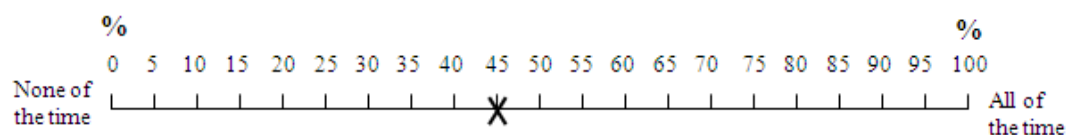
This questionnaire starts with some questions investigating how much time you spend *comparing* your own physical appearance to the physical appearance of others of the same sex.

These questions ask you to give your answer as a percentage:

- Please indicate your answer by using the percentage rating scale below each question.
- Please put a cross on the line at the percentage point which indicates your rating

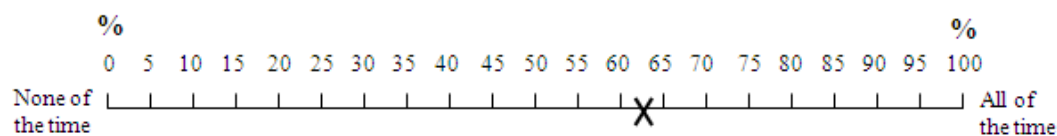
This mark can be placed anywhere on the line, for example:

The cross can be placed so that it directly corresponds to one of the percentage numbers shown, e.g.



OR

The cross can be placed so that it lies anywhere in between the percentage numbers shown, e.g.



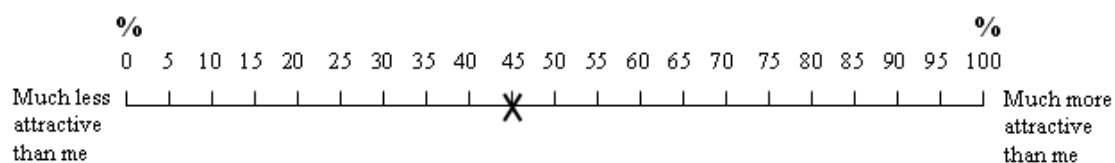
Please turn over for the last instructions.

The remaining questions ask you to give ratings of attractiveness or satisfaction on a scale of 0 to 100

- Please indicate your answer by using the rating scale below each question.
- Please put a cross on the line at the point which indicates your rating

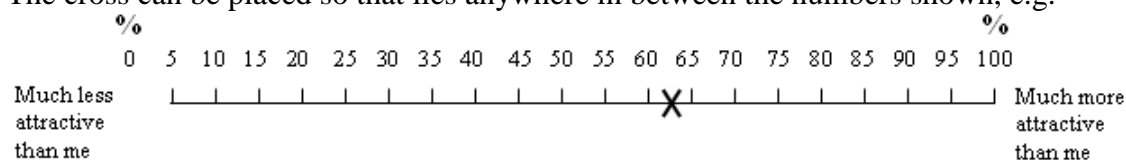
This mark can be placed anywhere on the line, for example:

The cross can be placed so that it directly corresponds to one of numbers shown, e.g.



OR

The cross can be placed so that lies anywhere in between the numbers shown, e.g.



(Please turn over)

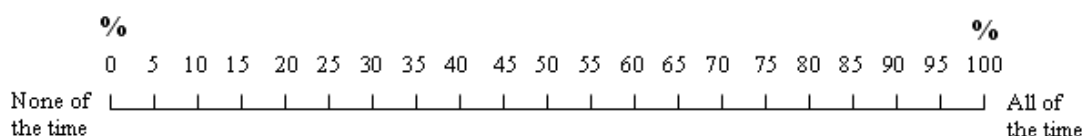
PART 1: COMPARING TO THE PHYSICAL APPEARANCE OF OTHERS OF THE SAME SEX

SECTION 1: Overall appearance and specific features

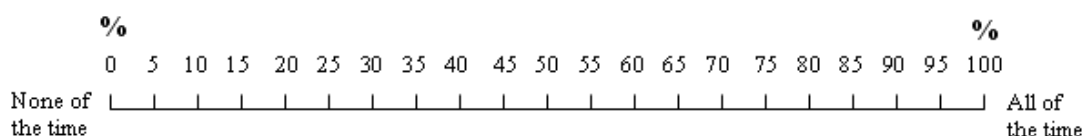
In situations when you see others of the same sex, i.e. when you are:

- Out in public
- In social situations/interacting with people
- When you are reading/looking at magazines, watching television/films, looking on the internet etc.

1. How often do you compare your overall physical appearance to the *overall* physical appearance of others of the same sex?



2. How often do you compare the specific facial or body features that you are most concerned about in yourself to the same *specific facial/body features* of others of the same sex?



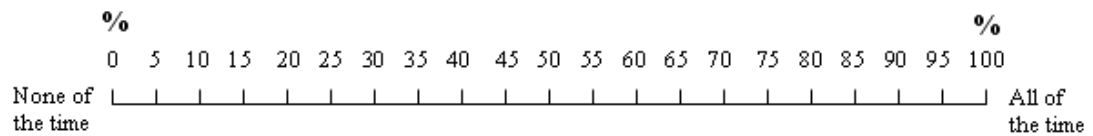
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SECTION 2: The attractiveness of people you compare to

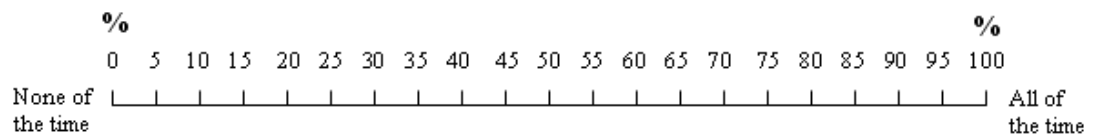
In situations when you see others of the same sex, i.e. when you are:

- Out in public
- In social situations/interacting with people
- When you are reading/looking at magazines, watching television/films, looking on the internet etc.

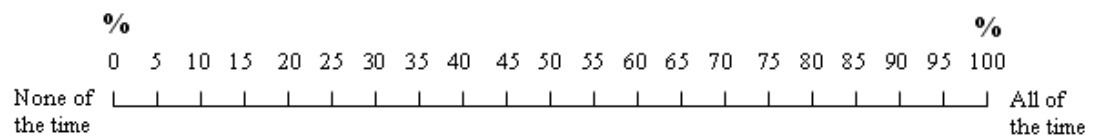
3. How often do you compare your physical appearance to the physical appearance of physically attractive others of the same sex?



4. How often do you compare your physical appearance to the physical appearance of physically average others of the same sex?



5. How often do you compare your physical appearance to the physical appearance of physically unattractive others of the same sex?



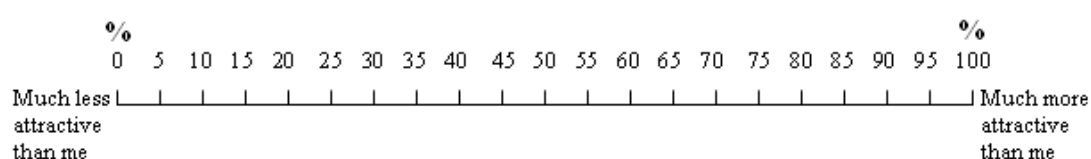
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SECTION 3: How do you rate yourself compared to others and how satisfied are you?

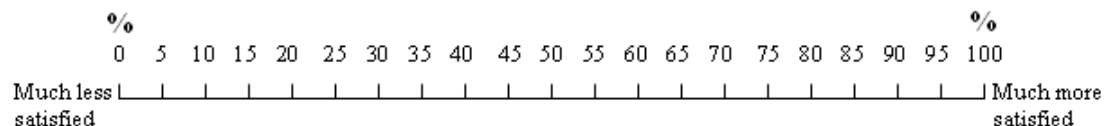
In situations when you see others of the same sex, i.e. when you are:

- Out in public
- In social situations/interacting with people
- When you are reading/looking at magazines, watching television/films, looking on the internet etc.

- 6. How do you generally rate/judge the physical attractiveness of others of the same sex (*in general*) in comparison to your own physical attractiveness?**



- 7. After comparing your physical appearance to the physical appearance of others of the same sex (*in general*): How much more or less satisfied with your physical appearance do you generally feel?**



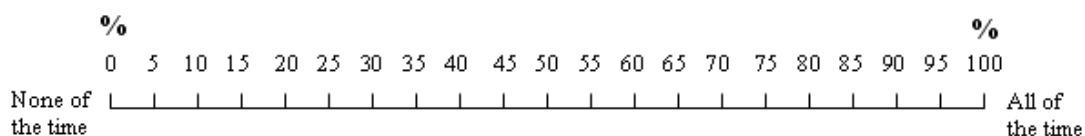
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SECTION 4: How automatic is comparing for you?

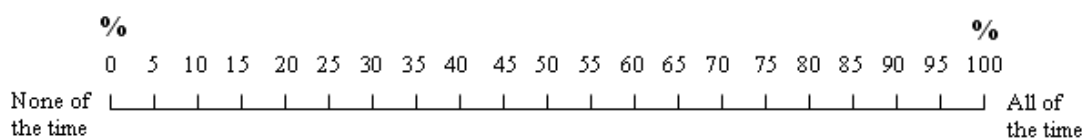
In situations when you see others of the same sex, i.e. when you are:

- Out in public
- In social situations/interacting with people
- When you are reading/looking at magazines, watching television/films, looking on the internet etc.

8. **How often do you find yourself comparing your physical appearance to someone of the same sex for a while without at first realising?**



9. **How often do you find yourself comparing your physical appearance to someone of the same sex automatically without a clear aim?**



END OF QUESTIONNAIRE

THANK YOU

6.8 Appendix 8: Beliefs about Appearance-Related Comparisons Scale

BA-RCS

Initials and participant number: _____

Date: _____

INSTRUCTIONS PAGE

This questionnaire investigates what beliefs you have about why you make comparisons between your own physical appearance and the physical appearance of others of the same sex.

We understand that comparing might be a very automatic process for some people but one with clear uses for others.

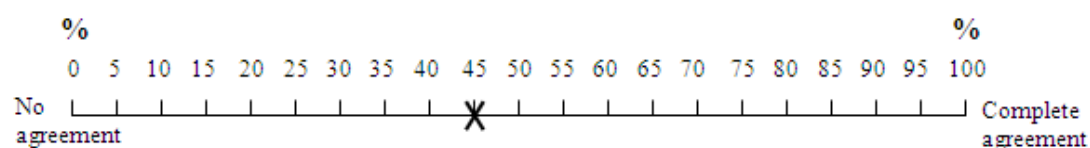
We would appreciate any thoughts you have about why you compare your physical appearance to that of others of the same sex.

Please complete the questions that ask you to give your answer as a percentage of how much you agree with the statements.

- Please indicate your answer by using the percentage rating scale below each question.
- Please put a cross on the line at the percentage point which indicates your rating

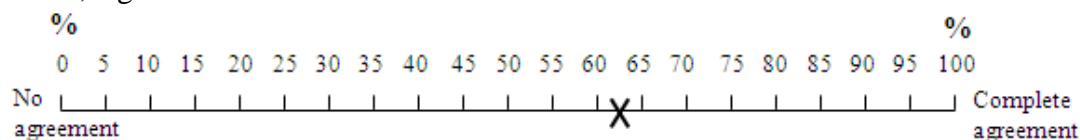
This mark can be placed anywhere on the line, for example:

The cross can be placed so that it directly corresponds to one of the percentage numbers shown, e.g.



OR

The cross can be placed so that it lies anywhere in between the percentage numbers shown, e.g.



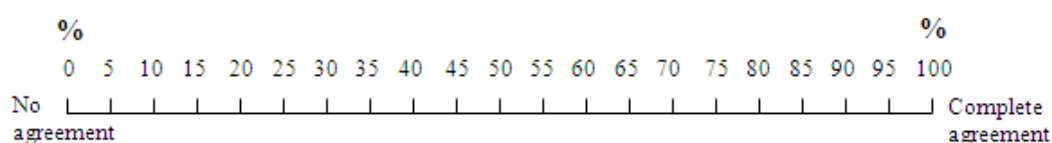
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**STATEMENTS ABOUT COMPARING YOUR PHYSICAL APPEARANCE
FOR MARKING HOW MUCH YOU AGREE WITH EACH ONE**

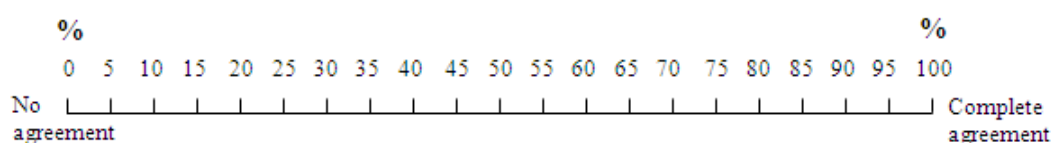
For each of the statements below please indicate how much you agree that you compare your physical appearance to that of other people of the same sex for that reason.

Comparing to check/verify for self-evaluation

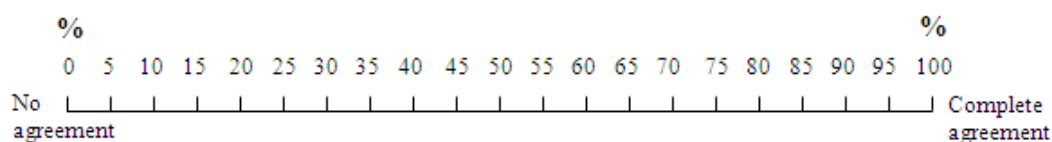
I compare in order to work out where my looks stand in comparison to others.



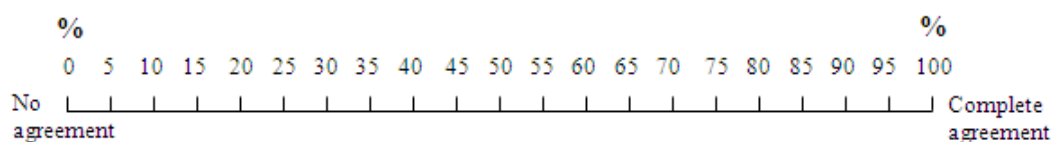
I compare to find out how attractive/unattractive I really am.



I compare to help me stop guessing about how attractive I am.



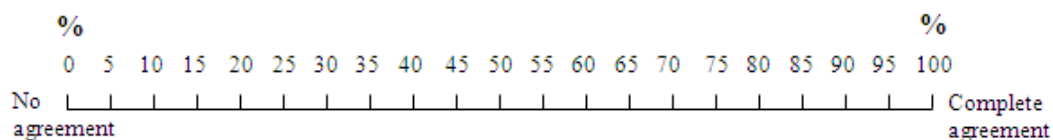
I compare to try and be more certain about where my looks stand relative to others.



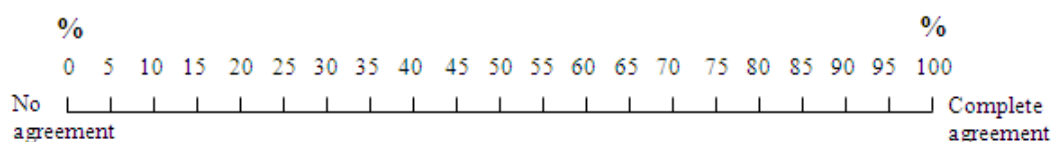
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Comparing to put something right through self-enhancement

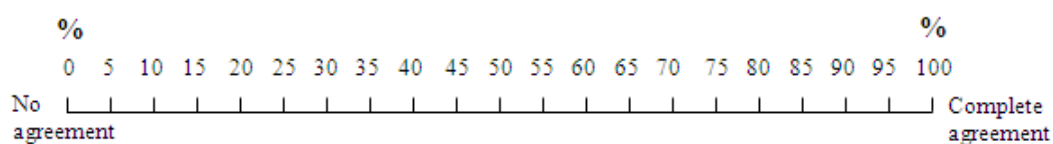
I compare in the hope that I will feel more comfortable about how I look afterwards.



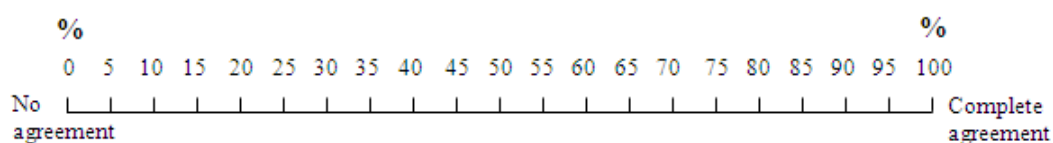
I compare to remind myself of what the positive things about my appearance are.



I compare to try and improve the way I think about my appearance.



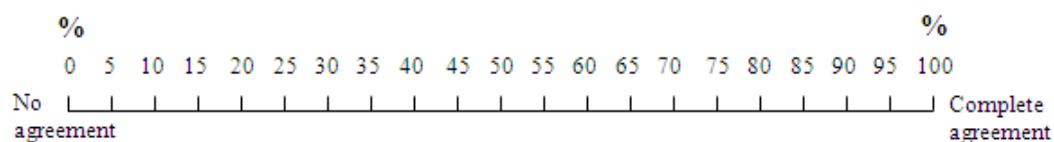
I compare to try and reduce the negative feelings I have about my looks.



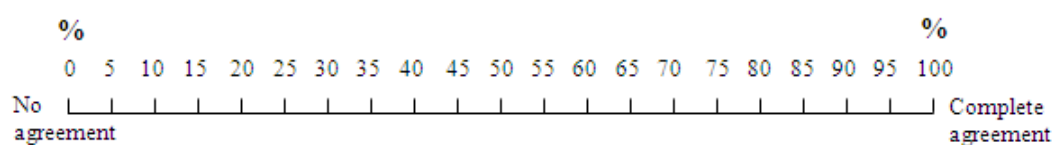
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Comparing to put something right through self-improvement

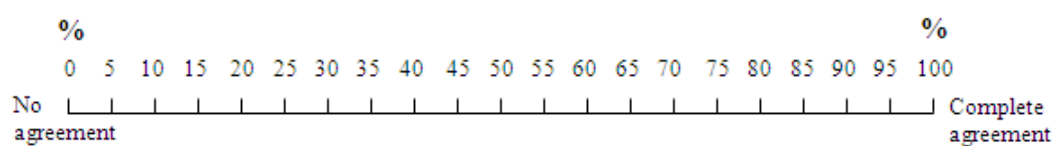
I compare in order to help me work out how I can improve my appearance.



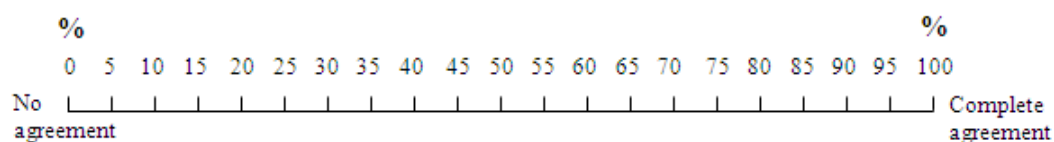
I compare in order to help me work out what not to do with my appearance.



I compare in order to help me work out how I can be more presentable to others in the future.



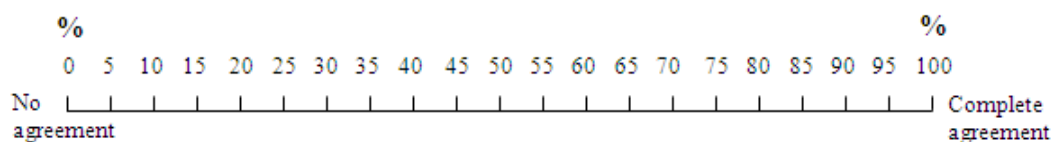
I compare in order to gather ideas about what to change about my appearance.



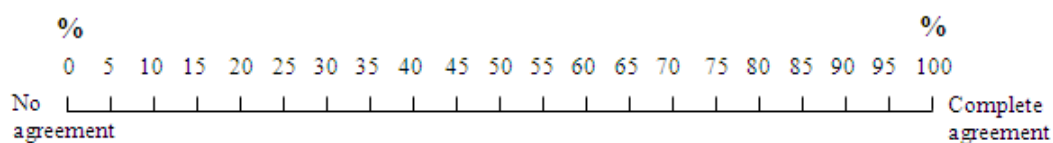
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Comparing as self-loathing

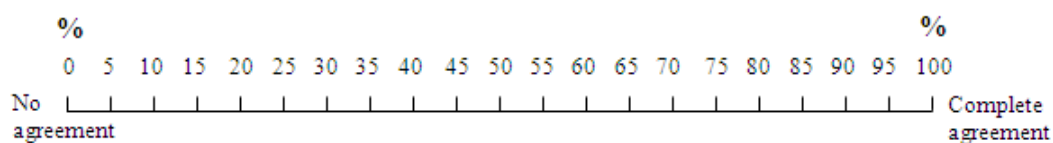
I compare in order to help me prove how unattractive my appearance is.



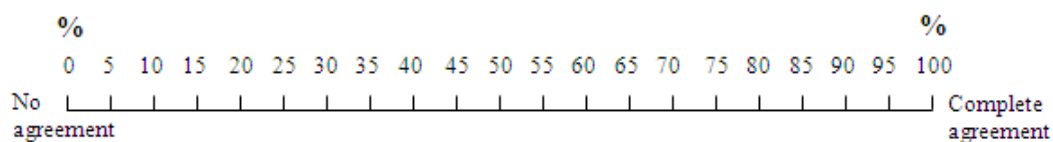
I compare in order to help me prove to myself that I am really ugly.



I compare so that I can understand how unattractive I am.



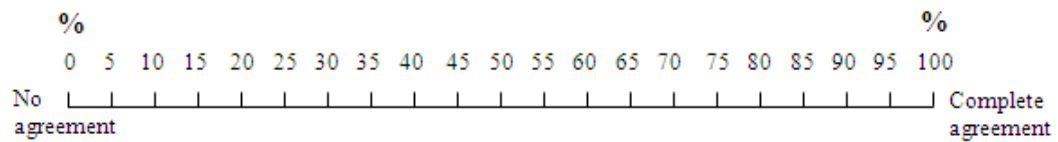
I compare to confirm which features of my appearance are flawed.



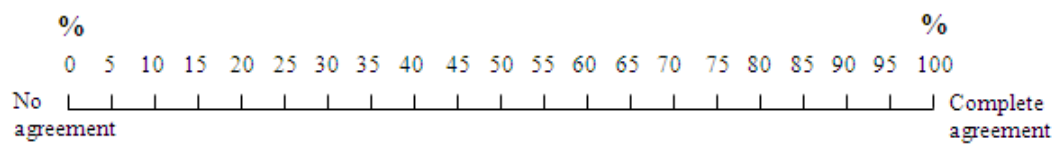
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Comparing as threat management

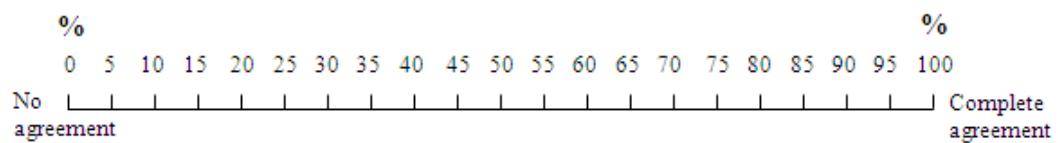
I compare in order to know what I should be hiding.



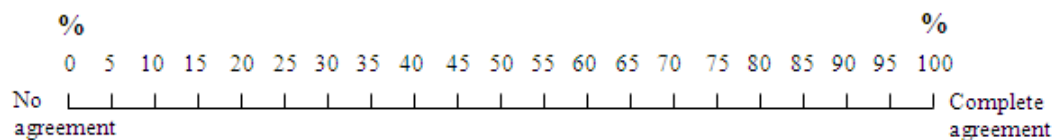
I compare in order to avoid places where people are much more attractive.



I compare in order to know if I should leave a place.



I compare in order to know if I should go and check my appearance.



END OF QUESTIONNAIRE THANK YOU

6.9 Appendix 9: Vignette task

Please read the paragraph on the next page carefully and circle all the PRONOUNS found within the paragraph (e.g. I, me, mine, my). Please take your time.

I go to the city often. My anticipation fills me as I see the skyscrapers come into view. I allow myself to explore every corner, never letting an attraction escape me. My voice fills the air and street. I see all the sights, I window shop, and everywhere I go I see my reflection looking back at me in the glass of a hundred windows. At nightfall I linger, my time in the city almost over. When finally I must leave, I do so knowing that I will soon return. The city belongs to me.

6.10 Appendix 10: Photographic portraits with physical attractiveness ratings

FEMALES SET A

DP-F-A5 f029



DP-F-A7 f467



DP-F-A6 f184



FEMALES SET B

DP-F-A3 f262



DP-F-A1 f074



DP-F-A2 f303



MALES SET A

DP-M-A1 m004



DP-M-A7 m043



DP-M-A8 m165



MALES SET B

DP-M-A3 m463



DP-M-A2 m143



DP-M-A5 m496



Matched physical attractiveness ratings for the photographic portrait sets

FEMALES

		PHOTO	AGE	ATTRACT	DISTINCT	SMILE
SET A	DP-F-A5	f029	2.7	5.8	5.0	3.3
	DP-F-A7	f467	2.3	5.7	4.2	5.0
	DP-F-A6	f184	2.3	6.3	4.2	4.0
				5.9		
SET B	DP-F-A3	f262	2.7	5.7	4.0	4.8
	DP-F-A1	f074	2.2	6.0	5.0	4.3
	DP-F-A2	f303	1.8	6.2	5.0	5.5
				5.9		

OVERALL AVERAGE = 5.9

MALES

		PHOTO	AGE	ATTRACT	DISTINCT	SMILE
SET A	DP-M-A1	m004	3.7	5.8	5.0	3.5
	DP-M-A7	m043	3.5	5.3	3.7	3.17
	DP-M-A8	m165	3.2	6.3	3.8	5
				5.8		
SET B	DP-M-A3	m463	2.8	5.8	4.0	5.67
	DP-M-A2	m143	2.7	5.5	4.3	5
	DP-M-A5	m496	2.5	6.2	4.7	5.5
				5.8		

OVERALL AVERAGE = 5.8

6.11 Appendix 11: Counterbalancing

Counterbalancing for males with BDD

ID	Experiment order	Initials & age	Seen (√)	Paid (√)
MB1	4. CAC Set B SFA Set A			
MB2	3. CAC Set A SFA Set B			
MB3	1. SFA Set A CAC Set B			
MB4	2. SFA Set B CAC Set A			
MB5	1. SFA Set A CAC Set B			
MB6	2. SFA Set B CAC Set A			
MB7	4. CAC Set B SFA Set A			
MB8	3. CAC Set A SFA Set B			
MB9	3. CAC Set A SFA Set B			
MB10	4. CAC Set B SFA Set A			
MB11	2. SFA Set B CAC Set A			
MB12	1. SFA Set A CAC Set B			
MB13	4. CAC Set B SFA Set A			
MB14	2. SFA Set B CAC Set A			
MB15	1. SFA Set A CAC Set B			
MB16	3. CAC Set A SFA Set B			
MB17	1. SFA Set A CAC Set B			
MB18	4. CAC Set B SFA Set A			
MB19	2. SFA Set B CAC Set A			
MB20	3. CAC Set A SFA Set B			

Counterbalancing for females with BDD

ID	Experiment order	Initials & age	Seen (√)	Paid (√)
FB1	1. SFA Set A CAC Set B			
FB2	3. CAC Set A SFA Set B			
FB3	2. SFA Set B CAC Set A			
FB4	4. CAC Set B SFA Set A			
FB5	1. SFA Set A CAC Set B			
FB6	4. CAC Set B SFA Set A			
FB7	2. SFA Set B CAC Set A			
FB8	3. CAC Set A SFA Set B			
FB9	3. CAC Set A SFA Set B			
FB10	4. CAC Set B SFA Set A			
FB11	1. SFA Set A CAC Set B			
FB12	2. SFA Set B CAC Set A			
FB13	1. SFA Set A CAC Set B			
FB14	2. SFA Set B CAC Set A			
FB15	3. CAC Set A SFA Set B			
FB16	4. CAC Set B SFA Set A			
FB17	3. CAC Set A SFA Set B			
FB18	4. CAC Set B SFA Set A			
FB19	1. SFA Set A CAC Set B			
FB20	2. SFA Set B CAC Set A			

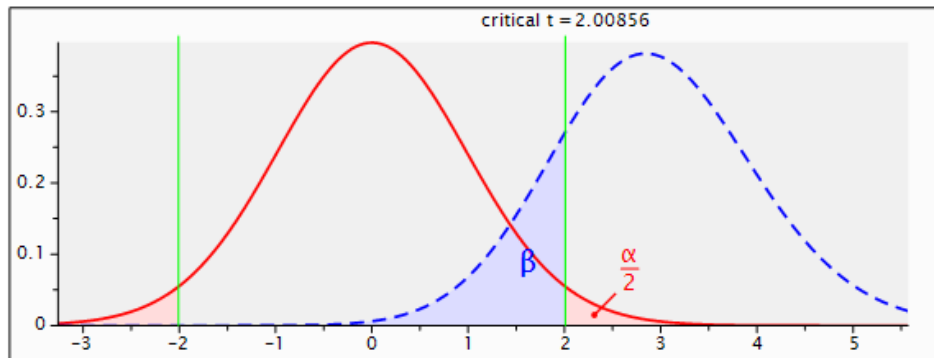
Counterbalancing for male healthy controls

ID	Experiment order	Initials & age	Seen (√)	Paid (√)
MC1	2. SFA Set B CAC Set A			
MC2	1. SFA Set A CAC Set B			
MC3	4. CAC Set B SFA Set A			
MC4	3. CAC Set A SFA Set B			
MC5	4. CAC Set B SFA Set A			
MC6	2. SFA Set B CAC Set A			
MC7	1. SFA Set A CAC Set B			
MC8	3. CAC Set A SFA Set B			
MC9	4. CAC Set B SFA Set A			
MC10	3. CAC Set A SFA Set B			
MC11	2. SFA Set B CAC Set A			
MC12	1. SFA Set A CAC Set B			
MC13	2. SFA Set B CAC Set A			
MC14	3. CAC Set A SFA Set B			
MC15	4. CAC Set B SFA Set A			
MC16	1. SFA Set A CAC Set B			
MC17	2. SFA Set B CAC Set A			
MC18	1. SFA Set A CAC Set B			
MC19	4. CAC Set B SFA Set A			
MC20	3. CAC Set A SFA Set B			

Counterbalancing for female healthy controls

ID	Experiment order	Initials & age	Seen (√)	Paid (√)
FC1	1. SFA Set A CAC Set B			
FC2	2. SFA Set B CAC Set A			
FC3	3. CAC Set A SFA Set B			
FC4	4. CAC Set B SFA Set A			
FC5	4. CAC Set B SFA Set A			
FC6	2. SFA Set B CAC Set A			
FC7	3. CAC Set A SFA Set B			
FC8	1. SFA Set A CAC Set B			
FC9	1. SFA Set A CAC Set B			
FC10	4. CAC Set B SFA Set A			
FC11	2. SFA Set B CAC Set A			
FC12	3. CAC Set A SFA Set B			
FC13	2. SFA Set B CAC Set A			
FC14	3. CAC Set A SFA Set B			
FC15	4. CAC Set B SFA Set A			
FC16	1. SFA Set A CAC Set B			
FC17	1. SFA Set A CAC Set B			
FC18	3. CAC Set A SFA Set B			
FC19	2. SFA Set B CAC Set A			
FC20	4. CAC Set B SFA Set A			

6.12 Appendix 12: distribution plot from G*Power 3.0.8™



Part 2: Service Evaluation Project

**Title: Reliable Digit Span as an indicator of
effort in outpatients with Traumatic Brain
Injury**

Trainee Clinical Psychologist: Mark A. Turner

Supervisor: Dr. Sebastian Potter

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1.0 Abstract

The assessment of effort has become a routine element of clinical neuropsychology practice. At the Lishman Brain Injury Unit outpatient service the Reliable Digit Span (RDS) is used for this purpose. The relevance of the extant literature to the use of the RDS in our service's context however is questionable. A retrospective observation of $n = 125$ neuropsychological assessments was carried out. 108 (86.4%) patients with traumatic brain injury passed the RDS and 17 (13.6%) failed. For RDS failures a higher than expected number of false positives was found. RDS failure was associated with poorer neuropsychological test performance, post-concussional symptoms, anxiety and depression but not medicolegal status or brain injury severity. The project's results are discussed with reference to limitations and suggested future service plans.

2.0 Literature Review

2.1 Definitions of effort and related terminology

Effort has been defined as a higher order concept akin to motivation that has a magnitude and a direction. That is, the extent to which a patient applies effort can vary and can do so in keeping with the task at hand or deliberately in opposition to it (British Psychological Society; BPS, 2009). Effort can also be unintentionally poor/suboptimal in some patients especially if they are depressed (Kaplan & Saddock, 1991). The term malingering however tends to be used for and defined as the intentional presentation of false or exaggerated symptoms motivated by external gain (BPS, 2009). Such gain is often thought to be monetary from litigation proceedings, especially following a Traumatic Brain Injury (TBI).

Neuropsychologists are rarely explicit in using the term malingering (Slick, Tan, Strauss, & Hultsch, 2004). This rare use is perhaps due to the consideration of effort as on a continuum: poorer performances on measures of effort are associated with poorer performance over a neuropsychological test battery (Nies & Sweet, 1994; Green, Rohling, Lees-Hayley, & Allen, 2001). More often neuropsychologists refer to the invalidation of test results, their inconsistency with the severity of injury, or

highlight that they are indicative of a symptom exaggeration (Slick et al., 2004). Other used terms which are perhaps more appropriate refer to a level of effort that is incomplete, sub-optimal or poor (Axelrod, Fichtenberg, Millis & Wertheimer, 2006; BPS, 2009). From here on in the term poor effort is preferred and used as an umbrella term that covers both intentional and unintentional underperformance. “Malingering” is written only in reference to literature that specifically uses this term to assist with cross-referencing.

2.2 Assessment of effort in clinical neuropsychology

The identification of poor effort can involve the use of information from medical records, the patient’s self-report, behavioural observations, and also the use of results from neuropsychological testing (Slick, Sherman, & Iverson, 1999). However, neuropsychologists commonly also employ Symptom Validity Tests (SVTs) which assess effort independent of the core neuropsychological testing battery that they administer. Examples include the frequently used forced choice task called the “Test of Memory Malingering” (TOMM) and the more recent “Green Word Memory Test” (GMT) (Sharland & Gfeller, 2007; Tombaugh, 1996; Green, 2003). The application of SVTs by neuropsychologists however is somewhat variable. The tests that have become the most popular are not necessarily those that are deemed the most accurate by those familiar with them (Sharland & Gfeller, 2007). This variability might well be due to the additional clinical time required for their administration especially in time-pressured settings.

Neuropsychologists can also gauge effort through the identification of score patterns on routinely administered tests deemed unusual based on knowledge of their rate of occurrence (Larrabee, 2003). The use of such embedded measures of effort is appealing because they are more disguised from those wishing to apply poor effort as compared to SVTs upon which litigants may be coached to pass (Rogers & Correa, 2008; Youngjohn, 1995). They also provide a means of assessing effort retrospectively where stand-alone SVTs were not employed (Mittenberg, Patton, Canyock, & Condit, 2002). The use of embedded measures of effort is therefore a much more justifiable asset to routine neuropsychological assessment and interpretation in general clinical practice.

2.3 Base rates of malingering in Traumatic Brain Injury

A summation across 11 studies which included data pertinent to the prevalence of poor effort found that around 40% (range, 15% to 64%) of participants were probably malingering (Larrabee, 2003; Trueblood & Schmidt, 1993; Heaton, Smith, Lehman, & Vogt, 1978, as cited in Larrabee, 2003). The base rate of malingering may depend on the population being observed (Larrabee, 2003): neuropsychologists have estimated the prevalence or “base rate” of probable malingering and symptom exaggeration to be around 30% of disability or worker’s compensation cases, 29% of personal injury cases, 19% among criminal cases, and 8% of medical cases (Mittenberg et al., 2002).

More specifically to TBI, Larrabee (2003) found 38.5% of litigating or compensation seeking mild TBI (MTBI) cases to be in keeping with probable malingering or symptom exaggeration. This figure rose to 41.24% when referral source was taken into account. Others who have studied more heterogeneous TBI samples have found that malingering tends to be more prevalent in milder TBI groups (Binder & Green, 1996; Green et al., 2001). Most research however is on mild traumatic brain injury (MTBI) patients involved in litigation being assessed for this purpose and so its applicability to more general clinical settings which see a proportion of people with MTBI, such as the Lishman Unit, is questionable.

In addition to base rates of malingering being highly variable, they are also difficult to ascertain. This difficulty is due to those attempting such behaviours actively trying to avoid detection and diagnostic standards continuing to be refined (Slick et al. 2004; Slick et al., 1999). Furthermore, because base-rates of malingering in general clinical samples may be of low frequency, this makes its prediction particularly challenging (Rosenfeld, Sands, & Van Gorp, 2000). Its identification is nonetheless very important given that effort can have a greater effect on suppressing neuropsychological test scores than moderate-severe brain injury (Green et al., 2001). This effect has also been illustrated in a UK sample whereby the systematic relationship between TBI severity and cognitive functioning was seen only in those passing a test of effort (Moss, Jones, Fokias, & Quinn, 2003).

2.4 Indices of predictive accuracy

There are different statistical methods for highlighting the predictive accuracy of a test in finding patients who are applying poor effort. The main two are sensitivity and specificity. Sensitivity would refer to the proportion of patients applying poor effort that is correctly detected taking into account the proportion of *false negatives*- the patients incorrectly predicted as not belonging to those applying poor effort. Specificity would refer to the proportion of patients who apply at least reasonable effort in testing that is correctly detected taking into account the proportion of *false positives*- the patients incorrectly predicted as belonging to those applying poor effort. It is therefore deemed important to have an effort test with high specificity at the cost of some sensitivity with the implication being that fewer patients are then wrongly portrayed as producing invalid test results.

Despite it influencing neither sensitivity nor specificity, when the base rate of poor effort is particularly low in a population, the number of false positives detected by a test inevitably increases relative to both true and false positives combined (Rosenfeld et al., 2000). This ratio forms an index of predictive accuracy known as a test's positive predictive validity (PPV). To utilise PPV however a gold standard of poor effort is required. Indeed research using the RDS test to study effort using known-groups designs has commonly organised the population(s) they have studied according to criteria considered as a gold standard for the assessment of malingering¹. Different indices of predictive accuracy are then documented for one or more RDS cut-off values for the identification of malingering as per the gold standard used.

Nonetheless, the association between false positive rate and specificity means that, along with data on the rate of a variable of interest in a known sample size, a binomial calculation can be used to test for a greater number of individuals failing an

1 In some studies this has been the use of criteria set out by Slick et al. (1999) whereas in others it has been the use of a forced choice symptom validity test (Heinly, Greve, Bianchini, Love, & Brenan, 2005; Meyers & Volbrecht, 1998). Others have organised groups on the basis of medical variables such as Glasgow Coma Scale ratings, brain scan results and length of hospital stay (Greiffenstein, Baker, Gola, 1994).

effort test than would be predicted just on the rate of false positives alone. The comparative population for this calculation is therefore the sample from which the published specificity data was derived from. For this project this calculation would open up the possibility that there are factors contributing to apparently poor effort identified at the Lishman Unit other than measurement error and false positives, including those other factors thought to exert influence on effort in the TBI populations studied in the research literature.

2.5 Professional practice guidance

The American Psychological Association (APA) and British Psychological Society (BPS) have recommendations for the use of effort tests routinely in clinical practice. As many as 79% of neuropsychologists report the use of at least one specific method for the detection of malingering in cases involving claims for financial compensation or personal injury litigation (Slick et al., 2004). Much of the literature however has been focused on medicolegal samples that are potentially unrepresentative to their use in clinical populations. It is important to characterise rates of RDS failure and its correlates, especially in relation to awareness of base rates of poor effort/malingering. This data then gives an indication of the characteristics of a service's clinical population that are being picked up as apparently applying poor effort. Indeed, it has been asserted that clinicians should be aware of base-rate differences which are pertinent to diagnostic decision making in their setting (Rosenfeld, et al., 2000). Moreover, BPS practice guidance recommends that clinicians are aware of the sensitivity and specificity of the effort tests that they use, as well as the base-rates of sub-optimal performance in the populations that they have contact with. These factors should then be considered in the interpretation of findings. Without following such guidance the quality of test results could be taken for granted and placed in the context of published normative data leading to assumptions that a patient has tried hard or applied poor effort in testing (BPS, 2009). Furthermore, and thinking more broadly, without such consideration the value of a neuropsychologist in care is reduced making their practice, and ultimately their service, less clinically valuable and less cost effective.

2.6 Reliable Digit Span as a measure of effort

The Reliable Digit Span (RDS) is one of several proposed embedded measures of effort based on data from the digit span subtest. The digit span subtest involves a patient being asked to repeat different strings of numbers that increase in length on every second trial. In the first half of the test (digits forward) the patient is required to repeat the digits verbatim, in the second half however the patient is asked to repeat the digits in reverse order (digits backwards). RDS is computed by adding together the longest number of digits attained twice in succession on the digits forward part of the test with that from the digits backward part (Greiffenstein et al, 1994). The RDS has indeed been found to have the best classification accuracy for effort of 17 embedded measures in a sample of individuals currently seeking medicolegal compensation (Miele, Gunner, Lynch, & McCaffrey, 2012). It is also very commonly used, being identified in a survey of clinical practice as the sixth most frequently used out of twenty-nine measures of malingering, and second only to the California Verbal Learning Test as the most popular embedded measure of effort (Sharland & Gfeller, 2007).

Using a known-groups design Greiffenstein et al. (1994) found that mild TBI (MTBI) probable malingerers scored significantly lower compared to both a moderate- mild TBI group and a MTBI persistent post-concussion syndrome group, which did not differ from each other, in terms of RDS score. Greiffenstein, Gola, & Baker (1995) similarly showed that probable malingerers scored lower compared to a group of severely brain injured patients, in terms of RDS score. In keeping with these results, Axelrod et al. (2006) found a group of MTBI patients who were probable malingerers to score significantly lower than both a TBI group with very low risk of malingering and a non-litigating MTBI group that did not differ from each other, in terms of RDS score. Mathias, Greve, Bianchini, Houston, Crouch (2002) also found that a mixed severity TBI group, without substantial evidence of malingering, scored significantly higher on RDS as compared to a probably malingering TBI group.

Although a cut-off of ≤ 7 has been used in some studies, this may sacrifice specificity at the cost of sensitivity, inflating false positive rates to unacceptably high levels (Jasinski, Berry, Shandera, & Clark, 2011). An RDS cut-off value of ≤ 6 to identify

those who fail RDS has been suggested as this is associated with good specificity and sensitivity (Greiffenstein et al., 1994). Greiffenstein et al. (1995) reported 86% sensitivity and 57% specificity for this RDS cut-off value. More recently, its use in a TBI-only sample was associated with a sensitivity of 0.39 and a specificity of 0.91 (Heinly et al., 2005).

Some research on the RDS test has used simulator designs requiring participants to behave as though they were malingering or as if they were TBI patients. Strauss Slick, Levy-Bencheton, Hunter, MacDonald, & Hultsch, (2002) used three groups (healthy controls, controls with professional knowledge of TBI, and non-litigating TBI patients) to study malingering. The participants were randomly allocated and instructed to either try their best or to malingering. There was a significant effect of this instruction. In each of the groups instructed to try their best the mean RDS score was above 10, while scores for the malingerers were below 7. It is also interesting that those asked to malingering were more inconsistent across three testing sessions compared to those trying their best.

The above research has been conducted on populations that are not necessarily representative of the TBI patients we routinely see in our outpatient clinic. Most research has focused on medicolegal patients with MTBI being assessed specifically for that purpose. At the Lishman Brain Injury Unit patients with a wide range of brain injury severities and accompanying post-concussional symptomatology are assessed to advance a clinical understanding of their needs. Research using the RDS has neglected the possibility that RDS failure is an indication of clinically relevant variables other than poor effort. It is noteworthy, for example, that the Greiffenstein studies and Mathias et al. (2002) show that the ability of RDS to exclude those not meeting criteria taken as indicative of malingering (and hence its specificity) lowers with increasing severity of brain injury. This implies that the RDS, in addition to measuring effort, may be sensitive to more severe brain injury or indeed perhaps the influence of other correlates. There is evidence for example that poor effort is also associated with greater post-concussional symptoms (Tsanadis, Montoya, Hanks, Millis, Fichtenberg, & Axelrod, 2008).

2.7 Aims and objectives

The current service evaluation project had three main aims. Firstly, we wished to identify the rate of RDS failure within a general UK TBI population/ amongst patients attending a tertiary clinic for out-patients with TBI for future reference in audit. In particular we considered whether the rate of failure was higher than might be accounted for solely by false positives based on a published false-positive rate for the test.

The second aim was to identify and examine a broader range of variables which we expected to be associated with RDS failure if the RDS is a measure of poor effort (e.g. lower severity of injury, medicolegal status, impaired neuropsychological performance and post-concussional symptoms). The third aim was to explore both the relationship between mood/ psychological symptomatology and the RDS test and the clinical information that might predict RDS failure.

2.8 Project questions and hypotheses

- I.** Based on the published specificity of RDS of 0.96 (and its false positive rate of 0.04; Heinly et al., 2005), is there evidence of higher-than-expected rates of RDS failure in our general clinical TBI sample based on a binomial calculation?
- II.** If RDS failure is a measure of effort to task associated with under-performance, RDS failure should be associated with being involved in a medicolegal claim, milder injury severity, and poorer neuropsychological test scores.
- III.** RDS failure was also expected to be associated with higher self-reports of post-concussional symptoms (Lange, Iverson, Brooks, Ashton Rennison, 2010).

2.8.1 Supplementary/exploratory analyses

What is the relationship between RDS failure and more general reports of anxiety and depression symptoms?

3.0 Method

3.1 Design

This project takes the form of a retrospective observation of neuropsychological assessments carried out with consecutive outpatients referred to a tertiary brain injury outpatient service over a 5/6 year period.

3.2 Patients

Our participants were n=125 individuals who had endured a TBI and were consecutively referred to the outpatient unit for neuropsychological assessment. All participants were assessed during the past 5/6 years.

3.2.1 Inclusion criteria

The patients included had suffered any severity of TBI. It was therefore possible to look at the influence of this variable on the RDS in a sample with a homogenous cause of injury and heterogeneity in terms of associated relative contribution of brain injury to ongoing cognitive difficulties (Lishman, 1988). The minimum amount of data required for inclusion was an RDS score, injury severity (measured, in the large majority of cases, using an estimation of post-traumatic amnesia) and information pertaining to whether or not they were or had been involved in a medico-legal claim.

3.2.2 Exclusion criteria

The inpatients attending the service as well as the outpatients who were not being seen due to a TBI but for other reasons (e.g. stroke; hypoxic brain injury; Korsakoff's syndrome) were excluded from participation.

3.3 Procedures

Each patient attending the outpatient clinic for a neuropsychological assessment typically completed a brief (30-minute) clinical interview followed by a standard

neuropsychological battery (lasting between 90 and 120 minutes). Some were asked to attend on another occasion for completion of this battery or for additional testing depending on their initial clinical presentation.

Data for use in this project was then gathered by assistant and trainee clinical psychologists from several sources kept on file within the Lishman Brain Injury Unit and added into a retrospectively updated electronic (Excel) database. The sources of information included clinical neuropsychology reports, the original neuropsychological test proformas and other relevant documentation such as neuropsychiatric assessments completed at the same clinical service.

3.4 Ethical considerations

Access to the original clinical data and that collated for the present work was only available to the clinical team. After data entry, information regarding scores remained anonymous and unidentifiable. Due to the use of these considerations, in the context of the retrospective design, no formal consent was sought from our patients. Approval for the project was instead approved through the audit committee of the local South London and Maudsley (SLaM) NHS Foundation Trust.

3.5 Instruments of measurement

Outlined below are the instruments routinely used in the TBI outpatient clinic.

3.5.1 National Adult Reading Test (NART)

Premorbid intellectual functioning was assessed using the NART (Nelson, 1982). The NART is formed of 50 printed words that are difficult to phonetically decode and pronounce based on their written presentation. The words also become progressively less familiar towards the list's end. The NART has been found to correlate with both current and childhood examinations of IQ in healthy controls (Crawford, Dreary, Starr, & Whalley, 2001). Reading ability as per the NART is relatively unaffected by various conditions affecting cognition, hence its use to estimate premorbid intelligence levels in these patients (Nelson & O'Connell, 1978).

NART errors were converted into predicted WAIS-R FSIQ equivalents (from the manual using the following formula ($=130.6 - [\text{cell reference with errors}] * 1.24$). No age corrections were applied.

3.5.2 Wechsler Adult Intelligence Scale – Third Edition (WAIS-III^{UK})

General intellectual functioning was assessed using age scaled scores from a short form of a comprehensive psychometric test of intelligence called the WAIS-III^{UK} (Crawford, Allum, Kinion, 2008). This short form included four of its verbal tests (vocabulary, similarities, arithmetic, and digit span) and three of its performance tests (block design, matrix reasoning, and digit symbol). Arithmetic was not used in analyses however as the neuropsychology service had only been using it for the last 2-3 years.

3.5.3 Reliable Digit Span (RDS)

Effort was assessed using the RDS which was calculated from the digit span subtest of the WAIS-III^{UK}. The RDS was computed by adding together the longest number of digits attained twice in succession on the digits forward part of the test with that from the digits backward part of the test (Greiffenstein et al., 1994). The RDS was used as the index of effort from the digit span subtest because it was routinely employed in our outpatient clinic and because it is the most frequently derived digit span index used in clinical practice (Sharland & Gfeller, 2007). An RDS cut-off score of ≤ 6 was used to identify those who failed this proposed assessment of effort because its use in a TBI-only sample has been found to correspond to a sensitivity of 0.39 and a specificity of 0.96 (Heinly et al., 2005).

3.5.4 Trail Making Test (TMT)

The TMT has been proposed as a test of processing speed, sequencing, mental flexibility and visual-motor skills (Bowie & Harvey, 2006). Part A requires patients to draw a pencil line to connect a set of 25 encircled numbers, in numerical order. Part B requires patients to alternate the line they draw between sets of encircled numbers and letters, while maintaining respective numerical and alphabetical orders.

Part B is therefore deemed to be a more difficult cognitive task with increased demands in motor speed and visual search (Gaudino, Geisler, & Squires, 1995).

Martin, Hoffman, & Donders (2003) found that Part B but not A was sensitive to severity of TBI. Others have found significant main effects for both Part A and B as a function of injury severity (Lange, Iverson, Zakrzewski, Ethel-King, & Franzen, 2005). Lange et al. (2005) also used regression analyses of different methods of scoring the TMT. Unique contributions to test interpretation beyond what were already available from Part A and B separately were not provided. For these reasons, the total completion times in seconds for each part were used as the values of interest.

3.5.5 Adult Information Processing and Memory Battery (AMIPB)

Tests from the AMIPB were used to assess memory and learning (Coughlan & Hollows, 1985). Verbal memory and learning were assessed with both immediate and delayed story and figure recall. Visual memory was assessed using trials A1-A6 of the list and design learning trials. In both cases however a score for A1-A5 was calculated because these trials are administered consecutively and therefore give a measure of learning and memory that is more likely to be normally distributed. A6 however is administered after a distracter list and so scores produced on this trial are additionally influenced by an interference effect. A6 was therefore entered as a separate variable. The intrusion and distracter (trial B) lists from the AMIPB were not used.

3.5.6 Controlled Oral Word Association Test (COWAT)

Verbal fluency was assessed using the COWAT (Ruff, Light, Parker, & Levin, 1996). This test involved patients being asked to produce as many words as possible beginning with the letter C, without the use of names, proper nouns or repeated words with different endings (e.g. cough, coughing), in a 60 second trial. The test is then repeated for the letter F followed by the letter L. Lesions in frontal parts of the brain have tended to result in reduced scores on the COWAT (Miceli, Caltagirone, Gainotti, Masullo, & Silveri 1981; Perret, 1974).

3.5.7 Hospital Anxiety and Depression Scale (HADS)

The HADS (Zigmond and Snaith, 1983) is a widely used 14-item self-report measure that was used to assess the severity of current symptoms of anxiety and depression in our patients. Each item uses a 4 point scale. The HADS has been shown to have acceptable reliability in a large non-clinical sample broadly representing that of the UK general adult population (Crawford, Henry, Crombie & Taylor, 2001).

3.5.8 Rivermead Post Concussion Syndrome Questionnaire (RPQ)

The RPQ was used to assess the severity of 16 post-concussion symptoms (PCS) over the past 24 hours by self-administration (King, Crawford, Wenden, Moss, & Wade, 1995). The patients were asked to compare each specified symptom on a scale from 0 to 4 (absent, mild, moderate, or severe) used to compare their severity in comparison to before the injury occurred. The specified symptoms cover the cognitive, emotional, and somatic domains which have been shown to be associated but at least partially distinct (Potter, Leigh, Wade, & Fleminger, 2006). The total score was used, as calculated using the method suggested by the original authors, ignoring any scores of 1.

3.5.9 Other measures

In addition to the above measurements being taken it was necessary for us to assess the medicolegal status of each patient. This variable was coded in three different ways. The first and primary way was to distinguish those that were from those that were not currently involved in medicolegal proceedings. In keeping with gold standard criteria for malingering the rationale for doing so was that a potential financial reward might form the primary incentive for applying poor effort (Slick et al., 1999). The second way was to distinguish those that had never been involved with a medicolegal claim from those who had, irrespective of if this was ongoing or not. The third way was to distinguish those that were currently involved with medicolegal proceedings from those with previous but closed medicolegal cases from those that had never sought compensation. A fourth level was needed here to highlight those who had medicolegal involvement but with an unknown status. The

rationale for these second and third ways of coding was that those who apply poor effort may be doing so through repeated rehearsal of symptoms as a process of attributing blame as opposed to something which is purely driven by a financial incentive. This is particularly relevant for our service given that people are assessed in a clinical context for that purpose.

An estimate of each patient's Post-Traumatic Amnesia (PTA) was also used to ascertain an approximation of injury severity. This was assessed retrospectively at interview using the Rivermead PTA protocol and coded in minutes as a continuous variable (King, Crawford, Wenden, Moss, Wade, & Caldwell, 1997). If clinical information gave a banding (e.g. 5-6 weeks) the median value was taken. In cases where clinical information allowed less exacting estimations (e.g. a few days; or, <1 hr; or, several days) only a categorical variable of brain injury severity was used. This was coded as mild (0-24hrs) (Kay et al., 1993), moderate (>24hrs-7 days) and severe (>7 days). For those cases where a PTA banding in days and/or minutes overlapped with two of these categories the category corresponding to the median value in minutes was used. Where it was possible to estimate PTA in the absence of precise durations a severity classification was still assigned. A Glasgow Coma Scale rating was used to estimate brain injury severity in one case. There was one case in which information specified 2 hours of PTA plus neurosurgery and so this was left uncoded due to the case's complexity. There were also three people who had insufficient data to ascertain an approximation of brain injury severity and so these data points were left uncoded. Time since injury was used and coded as the number of months elapsed.

3.6 Transformation into Z-scores

In order to manage our neuropsychological test battery data we transformed each of the above instrument's test scores into a common metric of Z-scores. The WAIS-R FSIQ equivalents derived from the NART were standard scores and the WAIS-III^{UK} subtests (which were expressed in age-adjusted scaled scores) were all converted directly into this common metric (see appendix 1). The TMT scores were converted into means and standard deviations, adjusted for age, using a regression equation associated with norms from a meta-analysis (Mitrushina, Boone, Razani, & D'Elia,

2005). This data was then converted into z-scores: inspection of the data indicated strong positive skews for both Trail A and Trail B data².

Scores from both the AMIPB immediate and delayed story and figure recall trials and the list and design learning trials (A1-A5, and A6) were converted into z-scores from the age-adjusted means and standard deviations found in the test's original normative data. (See appendix 1).

The COWAT produced both gender- and education-adjusted scores with corresponding percentiles for the total number of words produced using normative data from Ruff et al. (1996). For adjusted scores that lay between those given in the conversion table a mean percentile was used based on the percentiles corresponding to the adjacent adjusted scores. The nine adjusted scores from below the 1st percentile were considered to be at the 0.5th percentile. Percentiles were then converted directly into z-scores using an on-line conversion table. For percentiles that lay between those given in this conversion table mean z-scores were used based on the z-scores corresponding to the adjacent percentiles. The HADS and RPQ raw scores were used without transformation.

3.7 Composite measures

Our neuropsychological test battery allowed us to compute a maximum of 17 z-scores for each patient excluding the RDS and measures of mood and PCS. This data was therefore merged into a lesser number of composite measures of cognitive domains following some guidance from Miller and Rohling (2001).

3.7.1 Overall test battery mean (OTBM)

An OTBM was calculated as the mean of the means of the z-scores available for each patient from the maximum of 17. This calculation then allowed us to look at the association between neuropsychological test scores and RDS failure. It also allowed

² Median statistics are therefore reported in addition to means.

us to calculate an estimation of the variance in such test performance accounted for by poor effort as per the RDS.

3.7.2 Domain test battery mean (DTBM)

It has also been shown that effort influences domains of cognitive functioning differentially (Green et al., 2001; Curtis, Greve, Bianchini, 2009). The z-scores from our neuropsychological test data were therefore also clustered according to domains of cognitive functioning defined a priori. More specifically, z-scores from the vocabulary, similarities, matrix reasoning and block design subtests of the WAIS III^{UK} in addition to the NART were merged to create an intelligence (IQ) DTBM.

The z-scores produced from the AMIPB (design learning A1-A5 and A6, list learning A1-A5 and A6; immediate and delayed story and figure recalls) were merged to create a Learning and Memory (LM) DTBM.

Z-scores from the digit symbol subtest of the WAIS III^{UK} were not used in a DTBM. Indeed this subtest is more akin to a stand-alone test of processing speed possibly fitting under the umbrella term of executive functioning as opposed to one which would fit an IQ DTBM. Furthermore given that executive functioning might not be a unitary concept we could not justify using a small number of tests (the TMT part A and B and the COWAT) to create a DTBM for it (Jurado & Roselli, 2007; Miyake, Friedman, Emerson, Witzki, & Howerter, 2000). The digit span subtest of the WAIS III^{UK} was not added to a DTBM or to the OTBM to prevent a circularity of data in our statistical analyses.

4.0 Analyses

4.1 Treatment of Missing Values

As a consequence of our data being derived from information collected for a clinical purpose in the context of a retrospective design there were unavoidable missing values. To maximise the number of cases in each analysis however cases were “excluded pairwise/ test by test”. The use of this SPSS command meant that cases

entered an analysis if they had the required data for that analysis, irrespective of if they had missing data from other variables.

4.2 Choice of statistical tests

Heinly et al. (2005) found that an RDS cut-off value of ≤ 6 had a specificity of 0.96 and therefore an associated false positive rate of 0.04 in the TBI group that they studied. This specificity value was entered into a binomial calculation along with our sample size and our observed frequency of RDS failure at the same cut-off value. This analysis allowed us to ascertain if the rate of RDS failure in our sample was at a frequency significantly above chance level relative to that expected based on Heinly et al. (2005).

For comparisons of most categorical variables (RDS pass/fail with current medicolegal status, medicolegal history B and TBI severity) the minimum expected cell frequency of >5 assumption of the Pearson chi-square (χ^2) test was violated. The Fisher's exact test (FET) was therefore reported for RDS pass/fail with current medicolegal status. For comparisons of RDS pass/fail with medicolegal history B and TBI severity however the χ^2 test was used because this significance value was in keeping with the Cramer's V exact test associated with the choice of effect size measurement used. For the comparison of RDS pass/fail with medicolegal history A the χ^2 test was used.

Where parametric statistical tests were possible their suitability was assessed by considering the distribution of data for each analysis. Observations of histograms and boxplots were first made to form an initial impression of the data. The data's deviation from normality (using the Kolmogorov-Smirnov test), homogeneity of variance (using the Levene's test for group comparisons) and the presence of case outliers were assessed to inform our decision about what tests to employ. For each analysis if the data for the relevant RDS pass/ fail groups appeared reasonably normally distributed and homogeneity of variance and/or normality was preserved parametric tests were used. Preservations of both homogeneity of variance and normality were found in the RDS pass/fail group comparisons of IQ DTBM, LM DTBM and PCS. Homogeneity of variance only was preserved in the RDS pass/ fail

group comparisons of anxiety and depression. This data was not transformed however as this not considered a useful approach by all (Glass, Peckham, & Sanders, 1972).

Outliers have been reported as potentially misleading in data analyses (Osborne & Overbay, 2004). For parametric analyses where outliers were present tests were also trialled with their removal (Barnett & Lewis, 1994). Outliers were defined conservatively with the use of boxplot inspection³ (Tukey, 1977). Statistical significance was not altered much by this procedure. In addition, because outliers were not found more so in the RDS fail groups, we had little reason to believe that they were illegitimate. For these reasons, and to keep the overall TBI sample studied as similar as possible, results from untreated data has been reported.

For RDS pass/fail group comparisons of IQ DTBM, LM DTBM, PCS, anxiety and depression the data was considered reasonably normally distributed. Independent-samples t-tests were therefore used. For RDS pass/fail comparisons of PTA, time since injury and OTBM the data was considered not normally distributed. The RDS pass/fail groups examined were also very different in size by virtue of studying a variable (poor effort) of low base rate (Rosenfeld, et al., 2000). In this context the non-parametric analyses used were exact Mann-Whitney tests.

Estimates of effect size were made throughout. Cramer's *V* was used for cross-tab analyses. Cohen's *d* effect sizes were calculated from means and standard deviations and were weighted by group sizes (Thalheimer & Cook, 2002; see appendix 2). Effect size *r* was calculated for each non-parametric statistical test and converted to a Cohen's *d* where it was felt that this would assist interpretation (Rosenthal, 1991; see appendix 3). All analyses were conducted using SPSS for WindowsTM (version 17.0).

³ An outlier was therefore defined as 1.5*interquartile range above and below the 75th and 25th percentile, respectively.

5.0 Results

5.1 Missing values summary

Throughout the results section of this project data on the available sample size as a function of RDS pass/ fail group is given in tabulation or text corresponding to each statistical analysis used.

5.2 Descriptive statistics

5.2.1 Demographics

The demographics of the Lishman unit TBI sample are shown in table 1. The sample was mainly male (67.2%) and of a white ethnicity (68%). The mean number of year's education ($M = 12.96$) was roughly equivalent to having completed studies through to the end of English A-levels.

5.2.2 Injury characteristics

The injury characteristics of the Lishman unit TBI sample are shown in table 2. There was a larger proportion of patients failing the RDS who were not currently involved in a medicolegal claim (58.8%) as compared to those who were currently involved in such claims (35.3%). There was however a larger proportion of patients failing the RDS who had current or past involvement with a medicolegal claim (52.9%) as compared to those who had never been involved in such claims (35.3%). The proportion of patients failing the RDS who were currently involved in a medicolegal claim (35.3%) was more than those who had previous but closed cases (17.6%) but equal to those who had never sought compensation (35.3%).

The median (Mdn) PTA of the whole sample was 4 days, ($min = 0$ minutes, $max = 98$ days). The PTA of those failing the RDS ($Mdn = 4$ days, $min = 20$ minutes, $max = 56$ days) was very similar to that of those who passed the RDS ($Mdn = 4$ days, $min = 0$ minutes, $max = 98$ days). There were however a larger proportion of patients failing the RDS in the Mild TBI group (41.2%) as compared to in the Moderate and Severe

TBI groups; 29.4% and 23.5%, respectively). In addition, the median length of time since injury was shorter for those who had failed the RDS ($Mdn = 21$ months) as compared to those who had passed the RDS ($Mdn = 22.55$ months).

5.2.3 Neuropsychological functioning

Table 3 shows the neuropsychology data for the Lishman unit TBI sample. The mean of each of the 17 z-scores produced from our instruments of measurement was lower in those who had failed the RDS as compared to those who had passed the RDS. Furthermore these differences were consistently of a medium or large effect size ($max = .55$, $min = 1.05$).

IQ DTBM and LM DTBM data was available for $n = 125$ (RDS: pass, $n = 108$; fail, $n = 17$) and $n = 120$ (RDS: pass, $n = 103$; fail, $n = 17$), respectively. Indeed poorer neuropsychological test scores in those failing the RDS were evident in the OTBM as well as in both the IQ DTBM and LM DTBM. Median scores for TMT part A and B respectively were -1.28 (RDS: pass, -1.21 ; fail, -4.60) and $-.88$ (RDS: pass, $-.65$; fail, -7.38).

5.2.4 Post-concussional symptoms

Table 4 shows the mood/ psychological symptomatology data for the Lishman Unit TBI sample. PCS data was available for $n = 95$ (RDS: pass, $n = 83$; fail, $n = 12$). The level of post-concussional symptoms in those that failed the RDS ($M = 42.08$) was higher than that in those who passed the RDS ($M = 32.39$).

5.2.5 Anxiety and depression

Anxiety and depression data was available for $n = 115$ (RDS: pass, $n = 99$; fail, $n = 16$). The level of anxiety in those who failed the RDS ($M = 14.19$) was higher than that in those who passed the test ($M = 10.82$). The level of depression in those who failed the RDS ($M = 11.06$) was also higher than that in those who passed the RDS ($M = 8.26$).

Table 1. Demographics for the Lishman Unit TBI sample.

		<i>n</i>	%	Mean	S.D.
Whole sample		125	100	-	-
Gender	Male	84	67.2	-	-
	Female	41	32.8	-	-
Ethnicity	White	85	68.0	-	-
	Other ⁴	30	24.0	-	-
	Unknown	10	8.0	-	-
Age	Years	125	100	39.52	12.94
Education	Years	118	94.4	12.96	2.77
	Unknown	7	5.6	-	-

Note. TBI, Traumatic Brain Injury; *N*, number; S.D., standard deviation.

5.4 Inferential statistics

5.4.1 Rate of RDS failure

In our general clinical TBI sample of 125 patients 108 passed the RDS and 17 failed using the cut-off value of ≤ 6 . A binomial calculation demonstrated that there was statistically significant evidence of a higher-than-expected rate of RDS failure ($p < .0001$) based on this data and an RDS false positive rate of 4% (associated with a specificity of 0.96; Heinly et al., 2005). That is, there were more than expected false positives based on this published specificity data which could have been owing to the RDS test of effort picking up clinically relevant variables other than poor effort in the Lishman Unit TBI sample.

⁴ Details of the sample's ethnic diversity can be found in appendix 4.

5.4.2 Associations of RDS failure

There was no significant association between RDS pass or failure and whether or not patients were currently involved in a medicolegal claim (FET: $p = .370$, 2-sided, Cramer's $V = .09$). There was no significant association between RDS pass or failure and whether or not patients had ever been involved in a medicolegal claim ($\chi^2(1) = 2.607$, $p = .159$, exact, 2 sided, Cramer's $V = .15$). The more fine grained analysis of medicolegal status (as defined using Medicolegal History B) was then computed. There was again no significant association between RDS pass or failure and medicolegal status ($\chi^2(3) = 2.953$, $p = .380$, exact, 2 sided, Cramer's $V = .16$).

There was no significant difference between the PTA of those who passed and failed the RDS ($U = 419.50$, $p = .76$, exact, 2-sided, $r = -.03$). There was also no significant association between RDS pass or failure and whether or not the patients had sustained a mild, moderate or severe TBI ($\chi^2(2) = 3.468$, $p = .204$, exact, 2 sided, Cramer's $V = .17$). There was also no significant difference between RDS pass and failure in terms of length of time since injury ($U = 808.50$, $p = .683$, exact, 2-sided, $r = -.04$).

The result showing that those who failed the RDS compared to those that passed the RDS scored lower on the IQ DTBM was found to be statistically significant ($t(123) = -4.11$, $p < .001$, 2-sided). This result had a large effect size ($d = 1.08$). The result showing that those who failed the RDS compared to those that passed the RDS scored lower on the LM DTBM was also found to be statistically significant ($t(118) = -3.64$, $p < .001$, 2-sided). This result had a large effect size ($d = .97$). Furthermore the result showing that those who failed the RDS compared to those that passed the RDS scored lower on the OTBM was also found to be statistically significant ($U = 398$, $p < .001$, exact, 2-sided, $r = -.34$). This result had a medium effect size ($d = -.72$).

Table 2. Frequencies for the whole sample and as a function of both RDS and injury characteristics.

		RDS		
		Pass	Fail	Total
		<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
Whole sample		108 (86.4)	17 (13.6)	125 (100)
PTA	Ascertained	81 (75.0)	11 (64.7)	92 (73.6)
	Unknown	27 (25.0)	6 (35.3)	33 (26.4)
TBI	Mild	56 (51.9)	7 (41.2)	63 (50.40)
Severity	Moderate	14 (13.0)	5 (29.4)	19 (15.20)
	Severe	36 (33.3)	4 (23.5)	40 (32.0)
	Unknown	2 (1.9)	1 (5.9)	3 (2.4)
Current	Currently involved	27 (25.0)	6 (35.3)	33 (26.4)
Medicolegal	Not currently involved	78 (72.2)	10 (58.8)	88 (70.4)
Status	Unknown	3 (2.8)	1 (5.9)	4 (3.2)
Medicolegal	Current or past involvement	40 (37.0)	9 (52.9)	49 (39.2)
History A	Never involved	65 (60.2)	6 (35.3)	71 (56.8)
	Unknown	3 (2.8)	2 (11.8)	5 (4.0)
Medicolegal	Currently involved	27 (25.0)	6 (35.3)	33 (26.4)
History B	Previous but closed	12 (11.1)	3 (17.6)	15 (12.0)
	Never sought compensation	65 (60.2)	6 (35.3)	71 (56.8)
	Involvement but status			
	unknown	1 (0.9)	0 (0)	1 (0.8)
	Unknown	3 (2.8)	2 (11.8)	5 (4.0)
Injury type	RTA	44 (40.7)	6 (35.3)	50 (40)
	Assault	26 (24.1)	8 (47.1)	34 (27.2)
	Accidental	38 (35.2)	3 (17.6)	41 (32.8)
Time since	Ascertained	108 (100)	16 (94.1)	124 (99.2)
Injury	Unknown	0 (0)	1 (5.9)	1 (0.8)

Note. RDS, Reliable Digit Span; PTA, Post-Traumatic Amnesia; *n*, number; RTA, road traffic accident; TBI, Traumatic Brain Injury.

Table 3. Means (M) and standard deviations (S.D.) for Test, DTBM, and OTBM Z-scores for the whole sample and as a function of RDS pass/fail. ES (*d*) is also shown.

	RDS			
	<u>Total</u>	<u>Pass</u>	<u>Fail</u>	<u>ES</u>
	M (S.D.)	M (S.D.)	M (S.D.)	<i>d</i>
Domain				
IQ				
- Vocabulary	-.02 (1.25)	.13 (1.19)	-.96 (1.22)	.92
- Similarities	-.16 (1.06)	-.04 (1.0)	-.94 (1.09)	.9
- Block design	.05 (1.08)	.13 (1.02)	-.45 (1.29)	.55
- Matrix reasoning	.03 (1.13)	.18 (1.02)	-.92 (1.30)	1.05
- NART	.05 (.95)	.16 (.90)	-.70 (.96)	.96
DTBM	-.03 (.91)	.10 (.84)	-.82 (.98)	1.08
LM				
- List learning A1-A5	-.98 (1.47)	-.82 (1.41)	-1.97 (1.48)	.82
- List learning A6	-.96 (1.40)	-.83 (1.36)	-1.75 (1.42)	.68
- Design learning A1-A5	-.28 (1.28)	-.15 (1.19)	-1.13 (1.56)	.8
- Design learning A6	-.03 (1.17)	.06 (1.09)	-.67 (1.47)	.64
- Immediate story recall	-.49 (1.12)	-.41 (1.06)	-.97 (1.37)	.51
- Delayed story recall	-.58 (1.16)	-.48 (1.11)	-1.22 (1.27)	.66
- Immediate figure recall	-.27 (1.07)	-.18 (1.03)	-.88 (1.16)	.67
- Delayed figure recall	-.32 (1.08)	-.22 (1.05)	-.94 (1.08)	.69
DTBM	-.52 (1.01)	-.39 (.92)	-1.31 (1.18)	.97
Additional				
- Digit Symbol	-.92 (1.06)	-.81 (1.02)	-1.61 (1.11)	.78
- COWAT	-.47 (1.12)	-.35 (1.05)	-1.28 (1.32)	.86
- TMT A	-2.45 (3.96)	-2.20 (3.87)	-4.20 (4.29)	.51
- TMT B	-2.57 (4.90)	-2.01 (4.67)	-6.74 (4.68)	1.02
	Mdn	Mdn	Mdn	<i>d</i>
OTBM:	-.40	-.29	-1.81	-.72

Note. DTBM, Domain Test Battery Mean; OTBM, Overall Test Battery Mean; RDS, Reliable Digit Span; IQ, intelligence; LM, learning and memory; COWAT, Controlled Oral Word Association Test; TMT, Trail Making Test; ES, Effect Size; Mdn, median.

Table 4. Means (M) and standard deviations (S.D.) for RPQ and HADS total scores for the whole sample and as a function of RDS pass/fail. ES (*d*) is also shown.

	RDS			
	<u>Total</u>	<u>Pass</u>	<u>Fail</u>	<u>ES</u>
	M (S.D.)	M (S.D.)	M (S.D.)	<i>d</i>
- RPQ	33.62 (12.97)	32.39 (13.03)	42.08 (9.06)	.8
- HADS anxiety	11.29 (4.63)	10.82 (4.62)	14.19 (3.66)	.75
- HADS depression	8.65 (4.36)	8.26 (4.36)	11.06 (3.62)	.66

Note. RDS, Reliable Digit Span; RPQ, Rivermead Post-concussional Questionnaire; HADS, Hospital Anxiety and Depression Scale; ES, Effect Size.

5.4.3 Post-concussional symptoms and RDS failure

The result showing that post-concussional symptoms was higher in those that failed the RDS compared to those that passed the RDS was found to be statistically significant ($t(93) = 2.49$, $p = .015$, 2-sided). This result had a large effect size ($d = .8$).

5.4.4 Anxiety, depression and RDS failure

The result showing that anxiety was higher in those that failed the RDS compared to those that passed the RDS was found to be statistically significant ($t(113) = 2.78$, $p = .006$, 2-sided). This result had a large effect size ($d = .75$). The result showing that depression was higher in those that failed the RDS compared to those that passed the RDS was also found to be statistically significant ($t(113) = 2.44$, $p = .016$, 2-sided). This result had a medium effect size ($d = .66$).

6.0 Discussion

This service evaluation project examined the use of the RDS as a routine indicator of effort in a tertiary outpatient clinic for patients with TBI. The findings were to inform the clinical neuropsychology service and its future audit in keeping with professional practice guidance (BPS, 2009). There were three main aims addressed with several project questions and hypotheses for which partial support was found.

6.1 Rate of RDS failure

There were 17 (13.6%) TBI patients who failed the RDS (≤ 6 ; Heinly et al., 2005) and 108 (86.4%) who passed in the whole sample of 125 patients. This rate of poor effort is lower than both the average (40%) and minimum (15%) prevalence of probable malingering found in a summation across eleven studies by U.S.A based neuropsychologists with data pertinent to prevalence rates (Larrabee, 2003; Trueblood & Schmidt, 1993 as cited in Larrabee, 2003). However, American neuropsychologists may be more commonly assessing effort in the context of medicolegal claims for that purpose. Conversely our U.K.-based clinic patients are assessed for clinical reasons, especially for prospective cognitive behavioural therapy or cognitive rehabilitation, albeit with a proportion (49 out of 120 with recorded litigation status) of individuals either previously or currently involved in ongoing medicolegal claims. Involvement in a medicolegal claim is a known predictor of poor effort and malingering (Slick et al., 1999). If the primary reason for applying poor effort is indeed monetary then it would therefore make sense that the rate of poor effort at the Lishman Unit appears comparatively lower.

Nonetheless, based on the published specificity of RDS of 0.96 (and its false positive rate of 4%; Heinly et al., 2005) a binomial calculation showed that there was evidence of a statistically significant higher-than-expected rate of RDS failure in our general clinical TBI sample than might be expected if all the instances of RDS failure represented false positives. This result suggests that RDS failure may reflect an effect of some other variable in this clinical sample.

6.2 Associations of RDS failure

In contrast to our expectations, RDS failure was not associated with severity of TBI. Numerous studies have shown that poor effort and malingering is more common in people with milder brain injuries (Binder, & Rohling, 1996). It might be that milder TBI patients are more likely to apply poor effort because, in the context of litigation, their proceedings are often perceived as somewhat less clear-cut compared to more severe cases. At the Lishman Unit however, given that it offers a tertiary service, only more complex clinical cases are seen with the presence of PCS. There might therefore be less of a perceived need by patients with milder TBI to apply poor effort.

Similarly, and in contrast with more general findings from meta-analyses that show an association between increasing injury severity and more severe cognitive impairments, RDS failure was not associated with increased injury severity (Schretlen & Shapiro, 2003). The absence of this association is also not in keeping with the systematic reduction in specificity of the RDS with increasing severity of brain injury observed in some existing studies (Greiffenstein et al., 1994, 1995; Mathias et al., 2002). The RDS therefore did not seem to be effected by more “organic” effects of TBI in the current project in keeping with the digit span’s reported relative insensitivity to organic amnesia (Iverson & Franzen, 1991).

It is noteworthy that others have not found associations between injury severity and proposed measures of effort (Bowden, Shores, & Mathias 2006; Rohling and Demakis, 2010): the interpretation of these null findings continues to be discussed, with some arguing that this threatens their validity as effort tests (Bowden et al, 2006) and others suggesting otherwise (Rohling & Demakis, 2010). Nevertheless, associations between the RDS and other variables that appear important for the interpretation of this proposed index of effort were found in the present project.

RDS failure was also not associated with being involved in a medicolegal claim in the current project. This null effect held for all three methods of coding this variable. These findings are in contrast to the gold standard criteria for the identification of malingering in which current medicolegal involvement with a monetary incentive is

viewed as a primary criterion (Slick et al., 1999). It is however only one criterion amongst the cluster that Slick et al (1999) highlight. It has also been reported that such an association is more apparent for individuals with MTBI (Binder & Rohling, 1996). The present project's sample might have been lacking in power to replicate an association between MTBI specifically and medicolegal status however.

In keeping with other predictions, significantly poorer neuropsychological test scores were found in those who failed the RDS. This association was consistently the case throughout our neuropsychological data and was therefore apparent in the OTBM and both the IQ DTBM and LM DTBM, in keeping with Green et al. (2001), and consistent with the proposed role of RDS as a measure of effort. However, the proportion of variance in neuropsychological test performance that was explained by RDS failure (11%) was low relative to that in a larger litigating sample (53%, Green et al., 2001). This large discrepancy could be due to the RDS being a poor index of effort as compared to the composite measure of effort used by Green et al. (2001). Nonetheless, this difference might also be owing to the greater number of factors affecting OTBM in a clinical sample.

It is possible that a third variable influenced both the RDS and neuropsychological performance. For example, TBI patients pre-occupied with an apparent link between their history of a brain injury and a likelihood of cognitive impairments might underperform during neuropsychological testing due to the effects of rumination, or similar stimulus independent thoughts (SITs), using some working memory capacity (Teasdale et al., 1995). A similar phenomenon in a group of individuals with a history of MTBI but not seeking clinical or medicolegal help, described as “diagnosis threat”, was found to be independent of effort as measured by both self-report and a SVT (Suhr & Gunstad 2002; Suhr & Gunstad, 2005). It was however related to poorer performances in attention/ working memory including on the WAIS-III^{UK} digit span (Suhr & Gunstad, 2005). The concept of diagnosis threat might be inclusive of a process of SITs implicated in unintentional poor effort that the RDS is also sensitive to.

PCS were significantly higher in those failing the RDS. The difference in such symptoms between the RDS pass/fail groups amounted to a large effect size. This

result is supported by higher rates of PCS in people with MTBI who failed as compared to passed the TOMM (Lange et al., 2010). Others have found that PCS vary as a function of medicolegal status in a group of moderate-severe TBI patients (Tsanadis, et al., 2008). It is possible that there is shared variance between the effects of effort and litigation in terms of the extent of PCS reported by TBI patients.

In addition our supplementary analyses found that general reports of depression and anxiety symptoms were significantly higher in those who failed the RDS. Indeed the RDS is derived from an intelligence subtest of verbal working memory and the detrimental effect of depression on cognitive ability is a well established one (Elliott, 1998). It has also been suggested however that people who are depressed tend not to apply maximum effort (Kaplan & Saddock, 1991). It is worth noting that this is a process independent of medicolegal status or of other tangible secondary gains and can therefore be referred to as unintentional poor effort. A third variable might also be significant in mediating this relationship: for example blaming others more for a brain injury predicts depression (Hart, Hanks, Bogner, Millis, & Esselman, 2007). It is possible that such attributions around blame and responsibility feed into a process of poor effort and reinforces depressive symptomatology. Indeed, and building on a previous point, the deleterious effects of SITs on concurrent executive processing in depressed patients has gained experimental evidence (Watkins & Brown, 2002).

Major depression however, in both inpatients and disability-seeking outpatients, has been found not to influence the outcome of performance on the TOMM - a SVT measuring effort using a visual recognition memory format (Rees, Tombaugh, & Boulay, 2001; Yanez, Fremouw, Tennant, Strunk & Coker, 2006). If depression was contributing to the higher than expected rate of false positives for poor effort in our sample this rate should reduce with the use of the TOMM as compared to the RDS at the Lishman Unit. Given that our data is only correlational however it is also possible that those who apply poor effort on the RDS also over-report symptoms of depression.

It is interesting that those who failed the RDS also had significantly higher anxiety compared to those who passed. There is some correlational evidence that test anxiety negatively influences cognitive performance (Gass, 2002). Whilst the measure used

to assess anxiety in the present project focussed on more general symptoms, rather than test anxiety, those who have higher symptoms of clinical anxiety might be more likely to experience test anxiety. However, it is also possible that people who apply poor effort over-report anxiety symptomatology.

6.3 Limitations and future service plans

The method used in this project was a retrospective observation of neuropsychological assessments carried out for a clinical purpose. There was therefore an inevitable amount of missing data which contributed to some reduction in statistical power in the context of examining poor effort, a variable of low base rate (Rosenfeld, et al., 2000). Statistical measures were nonetheless taken to compensate for the difference in group sizes between those passing and failing the RDS. It is interesting to consider that significant associations with injury severity and/or medicolegal status might have emerged with a larger RDS fail sample. A larger sample size might have been found with a more liberal RDS cut-off of ≤ 7 (Jazinski et al., 2011). According to Heinly et al. (2005) however such change in criteria would lead to unsatisfactory false positive rates and indeed the present project has found this to be especially problematic in clinical samples when using ≤ 6 .

The design was also cross-sectional meaning that cause and effect could not be established. For example, our design cannot ascertain if PCS, anxiety, and depression cause TBI patients to apply poor effort or if people over-report such psychological symptomatology in their attempts to deliberately feign adverse consequences. Furthermore, our design cannot show that the higher rates of PCS, anxiety, and depression in patients failing the RDS are mutually exclusive psychological phenomena. Indeed postconcussion-like symptoms are frequently found in outpatients being seen for psychological treatment and, patients with depression often meet diagnostic criteria for this syndrome (Fox, Lees-Haley, Ernest, & Dolezal-Wood, 1995; Iverson, 2006). In addition, the design cannot rule out the possibility of extraneous third factors which cause both RDS failure and higher reports of psychological symptomatology.

Furthermore, this project did not have an independent gold standard of effort measurement, unlike research using known-groups designs, meaning that a base rate (excluding false positives) could not be ascertained. In future projects it might be useful to organise a Lishman Unit TBI sample (or subsample) according to criteria set out by Slick et al. (1999) or according to a purpose-built SVT like the TOMM or Green's Word Memory Test (Tombaugh, 1996; Green, 2003). Different indices of predictive accuracy could then be documented for one or more RDS cut-off values for the identification of malingering as per the gold standard used.

The presence of a gold standard measure of poor effort would also allow the base rate of poor effort in the TBI outpatients attending the Lishman Unit to be used to assess the utility of the RDS in terms of PPV (Heinly et al., 2005). Published standards of PPV denoting what can be considered a useful rate of poor effort detection exist (e.g. ≥ 0.5 , Kagehiro, 1990; Heinly et al., 2005; Greve & Bianchini, 2006; ≥ 0.8 , Valabhajosula & Van Gorp, 2001). If a non-satisfactory PPV is found then it might be appropriate for the Lishman Unit to consider applying a more conservative RDS cut-off value to improve its specificity by reducing the likelihood of a high false positive rate. The addition of a stand-alone SVT as a routine measure would also be in keeping with results that do not support the use of the RDS as a sole measure of effort (Miele et al., 2011). The clinical time that this proposed additional routine measure would take however might not be justifiable in a population with such a small base rate of poor effort. An alternative might be to cross-validate and then add a second embedded measure of effort in an attempt to improve the services predictive indices of effort measurement (e.g. Inman & Berry, 2002).

6.4 Conclusion

In conclusion, in a retrospective review of $n = 125$ neuropsychological assessments following TBI we found that 108 (86.4%) passed and 17 (13.6%) failed a proposed embedded measure of effort, the RDS. This rate of RDS failure included a higher than expected number based on predicted numbers of false positives using existing data on the measure. RDS failure was associated with poorer neuropsychological test performance as would be expected of a measure of effort. RDS failure was also associated with PCS, anxiety and depression. However, it was not associated with

medicolegal status or brain injury severity. Although the data showed partial support for the use of RDS as a measure of effort clinicians should be aware of these other correlates of RDS failure and not automatically assume intentional poor effort or malingering.

7.0 References

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8.0 Appendices

8.1 Appendix 1: conversion equation

The following equation was used to convert age adjusted data for the NART, WAIS-III^{UK} subtests and the AMIPB immediate and delayed story and figure recall trials and the list and design learning trials (A1-A5, and A6) into a common metric:

$$Z\text{-score} = (Patient\ score - population\ mean) / population\ standard\ deviation$$

For example, for WAIS-III subtests scores, defined as having a population mean of 10 and standard deviation of 3, a scaled score of 7 would be converted to a z-score of -1.0

8.2 Appendix 2: Cohen's d effect size equation

Cohen's d effect sizes were calculated using the equation below from Thalheimer & Cook (2002):

$$d = \frac{\bar{x}_t - \bar{x}_c}{\sqrt{\frac{(n_t - 1)s_t^2 + (n_c - 1)s_c^2}{n_t + n_c}}}$$

8.3 Appendix 3: effect size r equation

When using the effect size r the following equation from Rosenthal, (1991) was used:

$$r = \frac{Z}{\sqrt{N}}$$

8.4 Appendix 4: ethnic diversity in the sample

For a proportion of those coded as “other” in the Excel spreadsheet compiled in the service the following notes apply:

- 1 Bangladeshi
- 1 Algerian
- 1 Ethiopian
- 1 Mixed-Black
- 1 Jamaican
- 1 Pakistan/ Kenya
- 1 Belgian
- 1 Indian
- 1 Black British
- 1 Spanish
- 2 Caribbean
- 1 Black Nigerian
- 1 Iranian
- 1 Any other group- Asian
- 1 Cypriot
- 1 Any other group